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Academy Students' and Pre-Service Teachers' Perceptions of the Use of Electronic Technology in Their Personal Life and School Experiences in a Selected Union Conference

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ACADEMY STUDENTS' AND PRE-SERVICE TEACHERS' PERCEPTIONS OF THE USE OF ELECTRONIC TECHNOLOGY IN THEIR PERSONAL LIFE AND SCHOOL EXPERIENCES IN A SELECTED UNION CONFERENCE

A Dissertation

Presented in Partial Fulfillment

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Doctor of Philosophy

by

Alan R. Williams

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ABSTRACT

ACADEMY STUDENTS' AND PRE-SERVICE TEACHERS' PERCEPTIONS OF THE USE OF ELECTRONIC TECHNOLOGY IN THEIR PERSONAL LIFE AND SCHOOL EXPERIENCES IN A SELECTED UNION CONFERENCE

by

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Chair: Larry D. Burton

ABSTRACT OF GRADUATE STUDENT RESEARCH

Dissertation

Andrews University

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Title: ACADEMY STUDENTS' AND PRE-SERVICE TEACHERS' PERCEPTIONS OF THE USE OF ELECTRONIC TECHNOLOGY IN THEIR PERSONAL LIFE AND SCHOOL EXPERIENCES IN A SELECTED SEVENTH-DAY ADVENTIST UNION CONFERENCE

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Problem

The influx of N-Gen students into the classroom of teachers of earlier generations has created a digital generation gap. This gap has serious consequences for schools. For example, only half of the public school teachers who had computers or the Internet available in their schools use them for classroom instruction. However, today's students are very technology savvy, feel strongly about the positive value of technology and rely upon technology as an essential and preferred component of every aspect of their lives. It appears that the slow speed at which technology is changing the classroom is providing challenges to educators and students.

Method

This study used the survey research design method to examine the perceptions towards the use of technology based on the NetDay SpeakUp Day studies. As this study investigated students' and pre-service teachers' perceptions of technologies used in and out of the classroom, the survey research design was used to obtain information from students and pre-service teachers.

This study gathered information related to the status of technology use by pre-service teachers and by 11th- and 12th-grade students. These research data were collected through surveys of students and pre-service educators. Students were asked to participate through the school principals, and pre-service teachers were asked to participate through their educational training department chairs of their schools of the selected Union of Seventh-day Adventists.

Results

The first research question asked: "What are the perceptions of high school students' use of technology and their advanced technological abilities?"

Almost all (96.4%) of students in Grades 11-12 consider technology as important for their education. A small group (3.6%) seems to have significantly different views on technology and their education. About half of the students (50.8%) claim to get help with their school work using technology at school more than at place of residence. Less than half (46.1%) said they get help from place of residence. The students report showed that almost half of the students (47.5%) use the computer lab at school more than the

classroom computers or the library computers. Few of the students (2.6%) seem not to use computers regularly at school.

Research question 2 asked: "What are the perceptions of senior pre-service teachers in their technological abilities?"

In response to the question, "Teachers' who consider themselves well prepared by the school program use technology-related tools to enhance teaching," more than three-quarters (84.0%) indicated (Agree or Strongly Agree) they feel they are prepared to use computer productivity tools, whereas almost three-quarters (72.0%) believe they can handle using integrated technology tools in specific curriculum-related work. About two-thirds (68.0%) believe they can handle using integrated technology tools in general curriculum-related work. A little more than half (52.0%) feel they can use instructional technology tools. And less than half (44.0%) believe they can handle using technology instructional tools for management of their classroom or work.

Research question 3 asked: **"**What selected variables contribute to the advanced technological perceptions of students and pre-service teachers?"

To answer these questions two linear regressions were run, one for students and one for pre-service teachers. First to determine if a linear regression would be appropriate, a correlation test was run for the students between overall tech-savvy scores and technology variables of the perception of students. Three significant correlations were found as follows: (a) Products used on a regular basis at school, $r = .83$, (b) products used in all subject areas, $r = .58$, and (c) experiences in Internet use, $r = .84$. Based on these strong correlations, I then moved to a linear regression analysis.

Conclusion

What do we know about Adventist high-school students through this study? They are active computer users; they use desktop computers and laptop computers more regularly at their place of residence than at school. They may not have a variety of technology at school but seem to have a variety of technology at their place of residence since they use more computers there than at school. They are perceived to be savvy users with the technology available to them, although they did not have a great range of experience using much of the technology referred to in the survey.

They seem to have an interest in knowing how to use the technology at school since they said that not knowing how to use the technology was an obstacle to their productivity. Male students appear to be savvier than female students and this was due to the various out-of-school technologies they were using and/or exposed to. The results from this study reaffirm that there is a need for more training and support in the use of technology integration and interaction in Adventist schools.

What do we know now about the preparation and use of technology by pre-service teachers because of this study? Pre-service teachers feel that the preparation programs at Adventist colleges are adequately preparing them for use of technology in the classroom but they are still more likely to use computers at their home than at school to do professional preparations. It is important to note that the pre-service teachers in this study did not feel adequately prepared to handle most of the social and security issues in the classroom. Thus teachers' training programs should include training in computer security issues and how to handle these issues in the computer environment at school.

Pre-service teachers desire faster updates of hardware, software, and peripherals. They also want technical support available in their institution. They support a lab that would be open after school and during the weekends for professional practice and preparation for their teaching in the classroom. The pre-service teachers in this study rated their preparation to engage students in learning with technology as relatively weak when compared with other areas. This indicates the need to improve both pre-service and in-service training for technology integration in the learning process.

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CHAPTER 1

INTRODUCTION

Education has always included technology to assist teachers and students in the learning process. Books, pencils, pens, duplicating machines, film projectors, television, and all the other devices we can remember from earlier days in the classroom were state-of-the-art technology at one time. We used them to teach the basics, cover the subject matter, and reinforce the knowledge that was the objective of the educational process.

This generation of students is more knowledgeable, skillful, and exploratory with emerging technologies than previous generations. They come to school with new demands and expectations. According to Speaker (2004), "it is these students who are present in college classrooms and their expectations and learning styles demand changes in the traditional teaching paradigms" (p. 2). Tapscott (1998) coined the term N-Gen (Net Generation) to describe "those students and children who have grown up with the Internet and form an intergenerational culture through their actions online" (p. 345).

Speaker (2004) also stated that N-Gen "expectations and learning styles demand changes in the traditional chalk and talk paradigm that still exists in many lecture halls today" (p. 3). These expectations have created a need to move teaching and learning from blackboard to keyboard. Reed (2003) believed "digital content and networked

applications will transform teaching and learning" (p. 18). Teacher and student interaction with technology will continue playing a pivotal role in teaching and learning in spite of obstacles.

Whatever the cause, it seems that the teacher's perception of how often and how effective technology is used for student-centered purposes differs dramatically from actual students' perceptions (Judson, 2006, p. 582). Earlier research also suggests there are high levels of teacher apprehension about incorporating multimedia technology into individual classrooms, perhaps because of a lack of pre-service preparation in the use of educational technologies (Doering, Hughes, & Huffman, 2003; Murray, 2004). Three years later, Jeffs and Banister (2006) found that "pre-service teachers graduate from their programs with little experience in how to collaborate with their peers, and how to integrate technology into their daily lessons, and how to plan instruction for students with special needs [using education technology]" (p. 455).

There has been little investigation concerning the effects of developmental activities in the use of technology at schools. However, research has shown that activities like cell phone use and messaging, although they are popular, have little impact on the day-to-day integration of computing technologies in classroom teaching and learning (Hans, 2005; Jeffs & Banister, 2006; Jennings, 2002; O'Riordan, 2000).

Despite increased access to computers and related technology for students and teachers, schools experience difficulty in effectively integrating these technologies into existing curricula. Research by Lancaster (2006) suggests that the "lack of teacher training is one of the greatest roadblocks to integrating technology into a school's curriculum" (p. 47). These roadblocks have been described as short-term and devoid of

continuity due to inadequate follow-up and the lack of ongoing feedback from experts. In fact, a only small percentage of teachers report feeling very well prepared to integrate technology into instruction (Lewis, 2006). According to Friedman (2006), "the majority of teachers use the Internet infrequently, if at all, due to a lack of access to software, a lack of access to the Internet at students' places of residence, and a lack of time" (p. 809).

Statement of the Problem

The influx of N-Gen students into the classroom of teachers of earlier generations has created a digital generation gap. This gap has serious consequences for schools. For example, only half of the public school teachers who had computers or the Internet available in their schools use them for classroom instruction (Judson, 2006). However, "today's students are very technology savvy, feel strongly about the positive value of technology and rely upon technology as an essential and preferred component of every aspect of their lives" (NetDay, 2004, p. 3). It appears that the slow speed at which technology is changing the classroom is providing challenges to educators and students.

Purpose of the Study

The purpose of this study was to investigate the perceptions of 11th- and 12th-graders and pre-service teachers who are currently enrolled in a teacher education program in regard to the use of technology in a selected Union Conference of the Seventh-day Adventist education system. Specifically, this investigation explored the perceptions of pre-service teachers in two teacher education programs and the perceptions of senior high-school students preparing to enter college or the workplace, and to determine their advanced technological abilities in and out of the classroom.

Research Questions

The following three research questions guided this study:

1. What are the perceptions of high-school students' use of technology and their advanced technological abilities in a selected Union Conference of the Seventh-day Adventist education system?

2. What are the perceptions of senior pre-service teachers' use of technology and their technological abilities in a selected Union Conference of the Seventh-day Adventist education system?

3. What selected variables contribute to the advanced technological abilities of students and pre-service teachers in this selected Union Conference of the Seventh-day Adventist education system?

Research Hypotheses

Several hypotheses were formed to test each research question of this study.

Question 1 generated six hypotheses for students' perceptions of their advanced technological abilities in a selected Union Conference of the Seventh-day Adventist education system.

Question 1: What are the perceptions of high-school students' use of technology and their advanced technological abilities in a selected Union Conference of the Seventh-day Adventist education system?

From this question the following six hypotheses were created:

Hypothesis 1: There is a significant difference in students' perceptions by school type in the use of technology products in school by 11th- and 12th-grade students in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 2: There is a significant difference in student perceptions by school type in the use of technology products in school by 11th- and 12th-grade students in subject areas (English, Math, & Science) in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 3: There is a significant difference in student perceptions by school type in the use of Internet technology by 11th- and 12th-grade students in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 4: There is a significant difference in student perceptions by school type of obstacles in the use of technology resources by 11th- and 12th-grade students in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 5: There is a significant difference in student perceptions by school type in students' overall advanced technological abilities by 11th- and 12th-grade students in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 6: There is a significant difference by gender in the overall advanced technological abilities of students by 11th- and 12th-grade students in a selected Union Conference of the Seventh-day Adventist education system.

Question 2 generated 10 hypotheses for pre-service teachers' perceptions of their advanced technological abilities in a selected Union Conference of the Seventh-day Adventist education system.

Question 2: What are the perceptions of senior pre-service teachers' use of technology and their technological abilities in a selected Union Conference of the Seventh-day Adventist education system?

From this question the following 10 hypotheses were created:

Hypothesis 7: There is a significant difference between pre-service teachers' perceptions by teacher education programs in the use of technology products on a regular basis at schools in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 8: There is a significant difference between pre-service teachers' perceptions by teacher education programs in type of technology products used on a regular basis at their homes in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 9: There is a significant difference between pre-service teachers' perceptions by teacher education programs in the regular uses of technology products in preparation for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 10: There is a significant difference between pre-service teachers' perceptions by teacher education programs in the uses of Internet technology products used on a regular basis as a tool for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 11: There is a significant difference between pre-service teacher education programs where the preparation program has prepared pre-service teachers to use technology tools to enhance teaching and instruction in the classroom in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 12: There is a significant difference between pre-service teacher education programs in the regular use of technology for teaching and instruction in subject areas in a selected Union Conference of the Seventh-day Adventist education

system.

Hypothesis 13: There are significant differences between pre-service teacher education programs in the preparation to use technology for handling software security issues during teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 14: There is a significant difference between pre-service teacher education programs in technology resources and software resources available for use by pre-service teachers on a regular basis for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 15: There is a significant difference between pre-service teacher education programs in the regular use of hardware, software, and technology programs available for pre-service teachers on a regular basis at the institution for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 16: There is a significant difference by gender in the overall use of technology products and Internet experiences by pre-service teachers in the classroom or out of the classroom for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Question 3 generated two hypotheses and sought to determine which variables contributed to making students and pre-service teachers have advanced technological abilities in this selected Union Conference of the Seventh-day Adventist education system.

Question 3: Which selected variables contribute to the advanced technological

abilities of students and pre-service teachers in this selected Union Conference of the Seventh-day Adventist education system?

From this question the following two hypotheses were created:

Hypothesis 17: There are linear relationships between the overall advanced technological ability score and the independent variables of students' perceptions of technology in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 18: There are linear relationships between the overall advanced technological ability score and the independent variables of teachers' perceptions of technology in a selected Union Conference of the Seventh-day Adventist education system.

Significance of the Study

For this study pre-service teachers were selected since they were preparing and expected to enter the service where the students seem to be more active with education technology in and out of the classroom, and to identify if they perceived themselves to be prepared to facilitate K-12 students and the challenges they bring through the use of emerging and advanced technology.

This study provided data for Adventist educators at the tertiary and secondary levels to be informed in their judgments on the use of educational technology in the school setting. The information gathered can assist teacher education programs and educational technologists in developing strategic plans to change current practices and make improvements where applicable.

This study also identified factors that are significant in identifying students and

pre-service teachers with advanced technological abilities. Using these results can help refine curricula by including training in integration and use of advanced technologies in and out of regular classroom assignments for high school and tertiary students. This will hopefully contribute to meeting the needs of the pre-service teacher education programs in the North American Division of Seventh-day Adventists.

Theoretical Framework

While technology is making its way into the classrooms, Clark (2006) stated that "computer technology has not had the impact as hoped for" (p. 322). Several trends of prior research suggest that this lack of progress may include: (a) teachers' reluctance to learn new technology, (b) teachers' skill levels, (c) students' skill levels, (d) the skill gap between teachers and students, (e) scheduling constraints, (f) funding, and (g) an unfocused vision as to what technology integration should look like in schools (Adamy & Boulmetis, 2006; Lissner, 2006; Snider, 2002; Whitehead, Jensen, & Boschee, 2003). These key influences on the integration of technology in teaching and learning helped frame this investigation (see Figure 1).

Teachers' Reluctance

Lancaster (2006) suggested in her dissertation that despite increased access to computers and related technology for students and teachers, schools experience difficulty in effectively integrating these technologies into existing curricula. Lancaster pointed out that "the lack of teacher training is one of the greatest roadblocks to integrating technology into a school's curriculum" (Lancaster, 2006, p. 47). More than half of U.S. classrooms are now connected to the Web. Many teachers, however, report that their students do not use computers at all during a typical school day (Brush & Saye, 2009).

Cunningham (2007) reported in a position paper that teachers in many schools throughout the country are in the same situation. They are expected to implement technology with very little support or training. Without this support and training, teachers are very unsure about how to begin the implementation and how to use technology effectively in their classrooms. Because of these uneasy feelings, resistance to technology occurs (Cunningham, 2007).

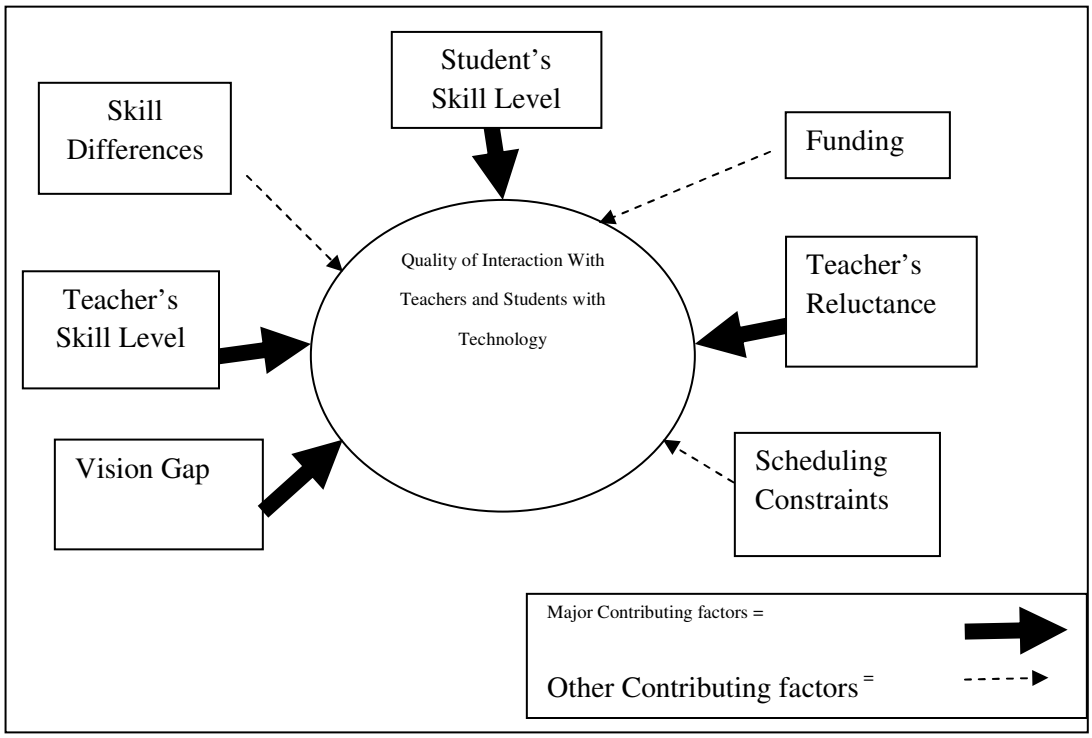


Figure 1. The gap between blackboard and keyboard.

Starr (2009) argues that staff development is the key to technology integration. For some, the problem of non-integration is a lack of technical training, a failure to teach teachers *how* to use the hardware, and the fact that teachers must be better trained in how to *use* the technology for instructional purposes (Starr, 2009). Speaker (2004) said that

"there is a lack of teacher preparation in educational technologies that has hindered the implementation of these very technologies in actual classrooms at every level" (p. 243). Jonassen, Howland, Marra, and Crismond (2008) said that "if schools are to foster meaningful learning, then the ways that we use technologies in schools must change from technology-as-teacher to technology-as-partner in the learning process" (p. 7). Teo (2007) said, "The success of student learning with computer technology will depend largely on the attitudes of teachers, and their willingness to embrace the technology" (p. 413).

Teachers' Skill Level

Technology has become an integral professional tool for many teachers, and is used to prepare materials for instruction, track student information, communicate with parents, or develop their own skills. When asked about using technology for professional tasks on a weekly basis, Jeffs and Banister (2006) found that pre-service teachers graduate from their programs with little experience in how to collaborate with peers, integrate technology into their daily lessons, or plan instruction for students. This suggests that graduates from typical teacher education programs lack the skills and knowledge to model technology use and/or teach their students how to effectively infuse technology into the learning environment.

Starr's data indicated that about "half of U.S. teachers use technology in classroom instruction. That use . . . varies greatly from school to school. In some schools, staff technology use nears 100 percent; in others, it is virtually non-existent" (Starr, 2009). However, only 11.3% of the nation's teachers feel they have advanced skills to integrate technology (Jeffs & Banister, 2006). Project Tomorrow reported that, nationally, 75% of teachers report that technology enhances student performance and

58% specify enhanced engagement in learning. With regard to technologies with the greatest potential to improve student success, teachers want to see computers in the achievement with 29% favoring digital curriculum to augment print products and 28% choosing online courses offered as an alternative to courses available at their school (Project Tomorrow, 2006, pp. 6-7).

Students' Skill Level

Today's students are early adopters and adapters of new technologies, creating new uses for a myriad of technology products to meet their sophisticated needs. Project Tomorrow reported that students today serve as technology trend-setters for their peers and, increasingly, for their parents and educators. The technologies they use in their personal lives slowly infiltrate into their schoolwork, and many of these technologies ultimately have found a home in their school day, even with their teachers (Project Tomorrow, 2009, p. 1).

Lancaster (2006) argued that by using computers, students today have access to the Internet and productivity tools at home and at school. Students can process information and solve problems, develop multimedia projects, and increase personal productivity. Lancaster went on to say that "computers have changed the way students learn and have become valuable educational tools" (Lancaster, 2006, pp. 3-4). Technology has enabled students to be user-communicators and more participatory learners. They develop strong teamwork skills (highly valued by employers as one of the most critical 21st-century work skills) and view the process of content development as a key part of the new learning process. For many students the process of developing

content is as valuable, or more valuable, than the end result. Thus, the learning process is king today—not the learning outcome (p. 2).

The Project Tomorrow report shows that the greatest increases in access in 2009 were in the middle school years: a 23% increase in cell phone access, 61% increase in laptop access, and an 85% increase in access to a smart phone for personal use. More than 28% of high-school students now also have personal access to a smart phone (Project Tomorrow, 2009, p. 4).

Advanced technology skills vary greatly even among students. Although most students have high expectations for technology use and integration, not all students may have the privilege of accessing computers and other technology either in or out of the school environment. Johnson and Maddux (2006) stated "that most public school educators had access to a computer in their school building and classroom, but students' access inside the classroom remained inadequate" (p. 36). It seems that this lack of access has denied teachers the opportunity to challenge students with activities that would further develop their skills. Johnson and Maddux continued, saying that "the majority of educators could access just one or two computers in their classrooms or primary work areas. Only a few had more than five computers for their students' use" (p. 36). Johnson and Maddux found that the ratio of students to computers has dropped impressively since the 1980s. Johnson and Maddux (2006) stated, "It is still nowhere near one-to-one. Most U.S. schools are equipped with one to five computers per classroom and one computer lab where each student spends less than one hour per week" (p. 37).

Skill Gap Between Students and Teachers

The technology age has created the need for a synergy between teacher and

student in the teaching and learning process. However Speaker (2004) stated that "college students are often far more skilled at using digital media than the professors who are teaching them, and classroom practices often do not meet student expectations especially in the area of integration and use of multimedia" (p. 2). Speaker (2004) suggested that, although many strides have been made lately for incorporating multimedia technology into classrooms, there is a lack of teacher preparation in educational technologies that has hindered the implementation of these various technologies in actual classrooms at every level. This suggests that students are left unchallenged due to lack of teacher preparation and interaction between teacher and student with the use of technology in the classroom.

Scheduling Constraints

Scheduling constraints impact both teacher and student access to and use of technology. Teachers need professional development specific to technology use and integration. However, finding adequate time in the school day or year is often difficult due to the many competing demands of teachers and administrators (Clark, 2006; Starr, 2009).

Similarly, since the number of computers in each classroom is limited and the typical student spends less than an hour per week in the computer lab, access to computer labs is primarily an issue of scheduling due to resource scarcity. Thus the potential impact of computer technologies on student learning is minimized by scheduling constraints (Lancaster, 2006). Without proper planning and scheduling, technology can become a disconnected add-on, creating a sense of frustration and loss of time rather than learning opportunities for teachers and students (Clark, 2006).

Project Tomorrow research showed that students consistently reported they are inhibited from effectively using computers or the Internet at school. Besides lack of time at school to use technology, students in 6th through 12th grades report their technology use is impeded by the ever-present school filters or firewalls, which block access to websites they need (43%), teachers who limit their technology use (35%), and rules that limit their use of technology at school (26%). One-third of the 3rd- through 12th-grade student respondents say their inability to use their own mobile devices (laptops, cell [smart] phones, MP3 players) and communicate with their classmates via their personal e-mail accounts or instant messaging accounts (IM) while at school is also a significant obstacle in their learning (Project Tomorrow, 2009, p. 2).

Funding

Previous research indicated the prevalence of budget challenges in schools across the United States (Charp, 2003). Funding remains a primary issue in many academic environments even now. Funding affects areas of faculty development, providing technology consultants for training, acquisition of additional hardware, software, and peripherals. Upgrading needs and compatibility issues are also exacerbated by a lack of finances. Funding is necessary for schools to achieve and maintain their commitments to positive, safe learning environments that engage all learners (Lock, 2006).

Project Tomorrow (2007) reported that many schools are starting to look at the finance problem from a different perspective, however. Using students' own technology devices gives educators an opportunity to leverage their financial investments in technology in other places. Instead, funding can then be spent on developing a robust infrastructure to support emerging technologies and training teachers.

Administrative support must be committed to make technology a priority by writing grants, forming corporate partnerships, accepting donations, and implementing pilot programs. Supporting technology is expensive because there are always new technologies being developed (Bin-Taleb, 2005; Lancaster, 2006). The issues that are foremost for consideration by school administrators and teachers include a budget to meet the cost of the technology, to train teachers in the use of technology, and to give the support needed to sustain computer integration in the classroom rather than to purchase specific devices for each student (Project Tomorrow, 2009, p. 5).

An Unfocused Vision

Pinnock (2006) argued that billions of dollars are spent annually to equip schools with computer technology; therefore, school leaders have a responsibility to ensure that technology is integrated in the school curriculum. Pinnock further suggested that educational technology integration has been challenged over the years by the existence of competing or fragmented visions as to what it should be (Pinnock, 2006).

The early theoretical work of Charles Wedemeyer emphasized the independence of the learner, the use of avoidable technology, and the relationship between the teacher and the learner (Wedemeyer, 1971). In many ways, Wedemeyer's work was a reaction against the norms, characterized by the teacher-centered, structured, and inflexible model for groups of learners (p. 548).

Thomas et al. (2007) believe that as the process continues, the theoretical groundwork for addressing the core issues of teaching and learning is developing in this age of technology. Three leading organizations, NetDay Organization, the Pew-Internet Organization, and the Intel Leap Ahead Organization, also state that theoretical

frameworks for educational technology are in the development stages and models are in the design process. The multi-faceted works of these three leading organizations have contributed to the theoretical framework in the development of this study.

There are many reasons for N-Gen students to embrace technology in schools (Gayeski, 2007), but adding more and more computers to improve learning without careful planning displays a lack of vision. In one early study, Mehan (1989) suggested that when "computers were introduced into an elementary school classroom, far from revolutionizing existing practices, these were adapted by the teacher to fit in with the habitual ways of doing things" (p. 5). Ringstaff and Kelley (2002) noted, "The overriding message that can be gleaned from the implementation of computer-based technology in K-12 education is that technology is a means, not an end; it is a tool of achieving instructional goals, not a goal itself" (p. 5).

Successful learning from computers will require increased attention to the design of lessons to incorporate those empirically valuable variables, such as corrective feedback, generative activities, and analogies that influence learning (Hannum, 2007). This type of planning requires teachers to sort important learnings from unimportant ones, as students do not have time to think about all of the information available (Saba & McDowell, 2007). Effective planning has effective results: "Only when we employ a systematic design process accompanied by superior pedagogy and lessons designed around empirically-validated learning principles will our use of computer technology in schools enhance learning outcomes. It never was about computers" (Hannum, 2007, p. 12).

Teachers need to prepare themselves and their students to deal with the current trend of fast-paced development of technology and the possibility of thinking computers. Technology is advancing at a very fast rate and no one knows what new advances will be made in the next few years (Sullivan & Hache, 2004, pp. 2-28). Today's computers are getting smaller and more powerful and are even more common in homes. All kinds of technology gadgets such as laptops, palm pilots, digital phones with email, digital cameras, and webcams are popular. Teachers need to keep up with these new advances so that they can help prepare their students for the future. One technique teachers can use is teaching students critical thinking skills so they can filter through all the information they obtain from computer technologies to help them apply reasons or solving problems appropriately (Sullivan & Hache, 2004, pp. 2-28).

Research done by Garrison and Anderson (2003) more directly addressed the issue of transaction in teaching and learning outside the structured constraints of education, and how it might work with developing technology. This allowed a clearer view of the pedagogical nature of teacher-student transaction and emphasized the effect of control on the transactional process. In the matter of control, Hossein (2009) suggested that with control-seen-as-influence, student-teacher dialogue becomes central to building a collaborative educational relationship. This helps reduce the transactional distance while maintaining learner autonomy and redefining the role of the instructor with the use of new pedagogy (Hossein, 2009).

Creating an interactive, intellectually challenging multimedia and digital technology environment must include an assessment of the learner, teacher, funding, and the changes that technology has already caused in schools and colleges. Snider (2002) suggested that

"many pre-service teachers were, however, concerned because they seldom saw technology use modeled in public school classrooms, and they believed low levels of access to technology would be a significant barrier to technology use" (p. 10).

Snider (2002) also suggested that "to accomplish such adaptations, many pre-service teachers, mentor teachers, and university instructors may need to revise their practices as well as their philosophies regarding teaching and learning" (p. 2). Since that time, teachers appear to be "turning technology devices into learning tools and a major milestone was reached when it was noted that teachers are using technology in the classroom" (Thomas et al., 2007, p. 4).

Lenhart (2005) stated that teachers who are integrating educational technology are helping tens of millions of students around the world every day. This is good news for teachers and students whose schools struggle to develop technology in the classroom as a comprehensive theoretical foundation that supports pedagogy unique to bridging the gap between the technology-savvy student and the teacher who knows little or nothing about technology. However, some research shows that the technology gap between teachers and students is in fact growing in spite of advances documented in some cases (Project Tomorrow, 2009).

Delimitations of Study

The participants in this study were delimited to pre-service teachers from tertiary institutions and high-school students in one region of the United States. All institutions were operated by the Seventh-day Adventist Church. The NetDay (2005) sampling design was used which consisted of the following stages: (a) random selection of a geographic area; (b) random selection of schools within the selected area, and (c) cluster

sampling of students within the schools that were chosen. As a result of this sampling strategy, the results of this study are directly applicable to educational institutions in the selected Union Conference and, by extension, apply to the North American Division Seventh-day Adventist educational system.

Definition of Terms

For the purpose of this research, the following terms have been used to identify key components in the study.

International Society of Technology in Education (ISTE): A nonprofit group that promotes the appropriate use of technology to support and improve teaching and learning; it has been instrumental in developing a set of fundamental technology concepts and skills for the National Council of Accreditation of Teacher Education (NCATE) (http://iste.org/).

National Education Technology Standards for Students (NETS-S): This document defines standards for students, integrating curriculum technology, technology support, and standards for student assessment and evaluation of technology use, developed by ISTE (http://www.iste.org/AM/Template.cfm?Section=NETS).

National Education Technology Standards for Teachers (NETS-T): This document, developed by ISTE, describes standards, assessments, and conditions that facilitate the use of technology to support student learning (http://www.iste.org/AM/Template.cfm?Section=NETS).

NetDay: NetDay was a volunteer project to contribute the resources of world high-technology companies to schools, libraries, and clinics worldwide to connect them

to the Internet (www.computerlearning.org/articles/NetDay.htm). NetDay transitioned into Project Tomorrow (see below).

PEW Foundation: A public charity, The Pew Charitable Trusts create and fund original, academic-quality research that explores the impact of the Internet on children, families, and communities (www.**pew**internet.org/reports/chart.asp?img=88_demos.jpg).

Project Tomorrow: This is a national, education nonprofit organization whose vision is to ensure that today's students will develop the critical thinking, problem solving, and creativity skills needed to compete and thrive in the 21st century with the use of technology (http://www.tomorrow.org/about/about.html).

Technology Savvy (also Tech Savvy): Describes persons who demonstrate advanced technological skills.

Organization of the Study

Chapter 1 of this study introduces the initial focus of the study and the areas that will be explored. The background of the problem and the specific research questions and the hypothesis are presented with definition of terms used throughout the research.

Chapter 2 of this study presents a literature review of multimedia and emerging digital technology as it relates to senior high-school students and pre-teachers in the education school system in a division of the World Church of Seventh-day Adventists.

Chapter 3 of this study gives an explanation of the development of the study. Also included are a description of the sample selection, type of research, descriptive framework, the research instruments, and a discussion of validity and reliability issues.

Chapter 4 presents the results and findings of the study. These results are based on descriptive and inferential statistical analysis. Descriptive statistics are primarily in the

form of *t* test and cross tabulations.

Chapter 5 gives an overview of the significant findings and considers these findings in terms of existing research. This chapter presents discussion, findings, conclusions, and recommendations for practice, future research, and implications.

CHAPTER 2

LITERATURE REVIEW

Introduction

The literature review identifies major schools of thought and presents the results of previous studies. It provides the necessary conceptual framework of the study and for understanding the issues raised as a backdrop to interpreting the findings. This review addresses a brief history of computer technology in education including a discussion on standards set for computer technologies used by students and teachers. Further it discusses and lends support for integration of computer technology into the curriculum. In addition it examines literature on computers in the private, Adventist education system, with discussion on development and use of technology by teachers and students. Finally the review presents an overview of the NetDay model for researching educational technology issues. NetDay, now Project Tomorrow, is a national nonprofit organization with a 10-year legacy of building local school and community capacity around technology use in education.

Information was accessed from a variety of sources including library research databases such as Education Research Information Center (ERIC) and research organizations' documents such as NetDay and PEW research. Procedures such as using keywords, basic searches, advanced searches, publications, and subject matter searches were used in order to find relevant material. Internet search engines such as Google,

Microsoft Live Search, Infoseek, USA Technology Daily, and Encarta Encyclopedia and Dictionaries were also searched in order to find relevant information.

A Brief History of Computer-Based Educational Technology

Scherer's (2008) historical account of computers suggested that computers in schools have been around for quite a while. A quick history check has it all starting around 1946 when the first vacuum-tube computers were being developed between government agencies, corporations, and universities. He also stated that by 1965 the Elementary and Secondary Education Act provided money for both mainframe and microcomputers in schools. He said that, in 1971, Intel developed its first microprocessor, and as a result the first PC's were produced on a commercial scale. Progress quickened. By 1986, 25% of schools had computers of some sort (Scherer, 2008).

Molnar (1999) characterized computers in education as an "accidental revolution" or "unthinking man and his thinking machine." He went on to suggest that the computer revolution has changed the adage that "necessity is the mother of invention" to "in a computer world; invention is the mother of necessity." Molnar's characterization is clear that "innovations in this field have created some of the most provocative and stimulating ideas in the history of education" (Molnar, 1999, p. 63).

To better understand current trends and issues in the use of computer technology in schools, it is useful to review the progress of technology use in education in recent decades. Wahle (2005) identified five eras of computer technology in education. Those periods are delineated as follows:

The 1970s

Wahle called this decade the golden age of "no technical assistance" (Wahle, 2005). During those years a calculator was magic and it was not allowed in the classroom. When teachers had their first hint of new technologies, they were not immediately accepting of students using them in the classroom.

The Early 1980s

Wahle described this as the era of "lots of promises" (Wahle, 2005), and suggested that it was a period when teachers were cautiously growing wiser. The first computers were being generally accepted but for some reason mainstream teachers were slow to adopt them. In-service classes were held trying to convince teachers to allow technological devices to buttress the learning process. Promises were made by educators and administrators who said, "Someday, you will be able to use the computer to produce" (p. 1). According to Wahle, most teachers decided to wait it out.

The Late 1980s

Wahle called this the period when "promises were unfulfilled" (Wahle, 2005), and submitted that by then those teachers who were using computers fought back. He stated that teachers were on their way to individualizing instruction in a way that was impossible before the computer arrived. Changes for implementation were rapid in schools and these changes were supported by the publishing companies who followed suit by incorporating interactive lessons into their texts for schools. Wahle noted that in spite of these changes by administrators and textbook publishers, most teachers decided to wait it out and not implement interactive lessons in their classrooms.

The 1990s

Wahle identified this period as the period when "information start[ed] flowing" (Wahle, 2005). Millions of students were happily tapping away on millions of computers, producing millions of sheets of paper. During this period what was once called typing became keyboarding. What was once a paper was now a document. He suggested that teachers were amazed when they were first shown the power of a word search in an encyclopedia disk. Students could now do hard research in their own classrooms and they became "super consumers" of information technology capabilities (Wahle, 2005). According to Cuban (2006), during the mid-1990s, educators believed that by "putting computers in every classroom we will revolutionize teaching and it is only a vehicle for teaching and learning" (p. 29). Fleischman (2006) stated that "1998 was the first time in 50 years that emerging technologies rapidly became commonplace. He suggested the best tool for forecasting the future is by predicting computing power advances" (p. 122).

The 2000s

Wahle described this period as when "information flows in two directions" (Wahle, 2005). Teachers started bringing authoring systems into their classrooms, systems that allowed them to create their own presentations and tutorials for students' interactions and learning. Wahle suggested that they were no longer just consuming interactive information, they were also producing it (Wahle, 2005).

Bitter and Legacy (2008) stated that the direction of technology use in schools is highly shaped by the National Technology Plan; the National Education Technology Standards (NETS) for teachers, students, and administrators; and the No Child Left Behind legislation. They also suggested that "profiles, performance tasks and performance indicators help provide a clear outline of what role technology should play

in education" (p. 36). They argued that leaders in the field of educational technology have studied the impact of teaching and learning long enough to suggest that its use has improved and enriched student learning. Just as "computers are a vital part of our society today," teachers, students, and parents are discovering the benefits of computer and technology (Bitter & Legacy, 2008, p. 35), and the power of integrating computer technology into the classroom for teaching and learning.

Integration of multimedia and advanced digital technology in classrooms is clearly not new; it has been a revolutionary technology in the learning process for several years now. NetDay (2005) suggested that, today, "some form of advanced digital technology drives the critical components of every academic organization with connected classrooms or those classrooms where personal computers with Internet connectivity have become a reality" (p. 4). This development has also provided opportunities for students with advanced technological ability, commonly called "tech-savvy," to develop skills in the use of tools that can be classified as advanced emerging digital technology (NetDay, 2005).

Koehl (2007) suggested that there will be "a strong connection between [Intel's] software and hardware research because they believe that in the future, both software and hardware may well be used for an assortment of applications" (p. 251). It appears that hardware and software may one day also be developed to complement, improve, or replace the conventional methods of teaching and learning, simulations, and artificial intelligence, for example. "Many teachers have taken up the challenge and schools have, at least in part, been transformed by the deployment and creative use of new technologies" (Cooper, 2009).

Setting Standards for the Millennial Generation

Emerging themes from NetDay (2004) indicated that today's students are creating a new norm for technology use that seamlessly combines learning both in school and out of school, entertainment, and communications into their daily activities (NetDay, 2004). Additionally, their research findings show that student use of new technologies such as instant messaging, music downloads, and cell phones have little or no gender differentiation. According to NetDay the greatest gender split continues to be in online gaming and video gaming. Younger students' access and usage of technology, particularly communications technology, is expanding dramatically, and these students are now pushing the expectations of greater use of technology in elementary school (NetDay, 2005).

According to Jeffery (2004), children born between 1988 and 2002 are the Net Generation, also called the N-Gen or Millennials. Jeffery went on to describe and differentiate three previous generations in the 20th century: "the 'Builders,' born prior to 1945, the 'Boomers,' born between 1946 and 1965, and the 'Busters,' born between 1966 and 1977" (p. 12). Tapscott (1999) coined the term "N-Gen" to describe "those children who have grown up with the Internet and form an intergenerational culture through their actions online; they can not imagine a world without instant messaging and music television (MTV)" (p. 11).

In fact, this generation of students is more knowledgeable, skillful, and exploratory with technology than previous generations. They come to school with new demands and expectations. According to Speaker (2004), "it is these students who are present in college classrooms and their expectations and learning styles demand changes in the

traditional teaching paradigms that still exist in many lecture halls today" (p. 242). This generation of students is actively using technology.

Thielfoldt and Scheef (2004) stated that "one of the most common activities that youth perform online is schoolwork." He called them the millennial generation and stated that they are the most technologically perceptive generation ever. He stated that there were about 51 million Generation Xs born from 1965 to 1976 and 75 million Millennials born from 1977 to 1998. As one might expect, this group is technically literate like no one else. Technology has always been part of their lives, whether it is computers and the Internet or cell phones and text pagers (Thielfoldt & Scheef, 2004).

According to Pew Internet and American Life research, 85% of youth aged 12 to 17 engage at least occasionally in some form of electronic personal communication, which includes text messaging, sending email or instant messages, or posting comments on social networking sites (Pew, 2008). The Pew statistics showed that beyond using technology to facilitate their writing, teens also use the Internet to research their school projects; 94% of them use the Internet, at least occasionally, to do research for their school assignments. The report also showed that nearly half (48%) of teens say they use the Internet to research something for school once a week or more often (Pew Internet and American Life Project, 2008).

Sullivan and Hache (2004) suggested that teachers need to prepare themselves and their students to deal with the current trend of fast-paced development of technology and the possibility of thinking computers. They suggested that teachers can do so by keeping up with the new advances so that they can help prepare their students for the future. It is also important to teach students critical thinking skills so they can filter

through all the information they obtain from computers so they can apply reasoning to solve problems appropriately (Sullivan & Hache, 2004) through the use of technology.

NetDay Contribution

The term tech-savvy was coined by NetDay in their 2004 survey report "on the voices and views of today's tech-savvy students" (p. 2). This report was based on the NetDay SpeakUp Day for Students in 2003; these are annual online surveys. Up to 2005, these surveys centered on the tech-savvy teacher and student by providing students and teachers with a voice in national and local policies that impact education. NetDay provided opportunity for the insights and ideas of the nation's teachers and students on educational technology to be expressed (Project Tomorrow, 2006, p. 3). NetDay reported on the major themes from national findings. One finding was a definition of who could be considered to be tech-savvy (NetDay, 2004, p. 15).

The NetDay definition of tech-savvy students includes the following eight characteristics:

1. They feel strongly about the positive value of technology and rely upon technology as an essential and preferred component of every aspect of their lives.
2. They are already "pushing the envelope" in terms of technology, both for themselves and for their free time.
3. They are tomorrow's technology innovators.
4. They are very masterful communicators, using email and Internet messaging (IM) in new ways to surprise their teachers and parents.
5. They view online communications as a very personal exchange medium, not a cold, impersonal, machine-to-machine operation as many adults do.
6. They do not want to be limited as to where and when they use technology.
7. They have good ideas about technology use and they want to help improve their schools and communities.
8. They are defining what it means to integrate technology within education. (NetDay 2004, pp. 20-27)

National Education Technology Standards for Students (NETS-S)

While some students will be tech-savvy, the International Society for Technology in Teacher Education (ISTE) wanted to describe the level of technological skill *all* students should attain. This resulted in the following six National Education Technology Standards for Students (NETS-S):

1. Creativity and Innovation: Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
2. Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
3. Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
4. Critical Thinking, Problems Solving, and Decision Making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
5. Digital Citizenship: Students understand human, cultural, and responsible use of information and technology.
6. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems, and operations. (ISTE, 2007)

National Education Technology Standards for Teachers (NETS-T)

Similarly, standards for all classroom teachers were developed by ISTE as the National Education Technology Standards for Teachers (NETS-T):

1. Facilitate and Inspire Student Learning and Creativity: Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.
2. Design and Develop Digital-Age Learning Experiences and Assessments: Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS-S.
3. Model Digital-Age Work and Learning: Teachers exhibit knowledge, skill, and work processes representative of an innovative professional in a global and digital society.
4. Promote and Model Digital Citizenship and Responsibility: Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices. Productivity

and professional Practice: Teachers use technology to enhance their productivity and professional practice.

5. Engage in professional Growth and Leadership: Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources. (ISTE, 2008)

Examination of Integration of Technology Into Education and the Classroom Curriculum

Defining Computer-based Technology Integration

Recesso and Orrill (2008) define computer-based technology as a tool, unlike any other tool for teaching and learning. They explained it as incorporating computer hardware, software, and their various components. They also included the term *technology* to refer to audiovisual, media, and technological items that can be used in the classroom (Recesso & Orrill, 2008, p. 8).

Several studies have been done on how technology is used in classrooms (Barker, 2007; Boettcher, 2006; Moursund, 1999; National Center for Educational Statistics [NCES], 2009; Solmon, 1999; U.S. Department of Education, 2008). Some of these studies focused on an inventory approach by counting computers, calculating student-to-computer ratios, and tallying computer time. Many of these researchers believed that computer technologies offer special help because they allow for the building of the more intimate and supportive types of learning environments called for by a constructivist perspective (Hay, 1993; Jonassen, 1995). However, Johnson and Maddux (2006) have advocated the integration of technology in education since 1982. They claim slight progress has been made toward these goals and wonder why success has being limited (p. 14).

Johnson and Maddux (2006) also identified four conditions that must be favorable before total technology integration can come to pass: First, the following pre-conditions must be in place: capacity, hardware, software, and connectivity. These must be at a level of sophistication that makes full integration possible. Next, student and teacher access to the appropriate technology must be widespread enough for full integration to occur. Effective teaching and learning strategies must then be implemented by classroom teachers. Finally, social and political support must be in place. Policy-makers must be aware of what constitutes best educational practices and must support its implementation in schools. Each of these four conditions will impact on total integration of technology in education (Johnson & Maddux, 2006, pp. 14-15).

Challenges in Integrating Computer-based Technology in the Classroom

The schools of the North Central Regional Educational Laboratory (NCREL) (2004) and Metiri Group (2004) suggested that school leaders need to help students become technologically literate, and leaders should consider increasing educator technology effectiveness and modeling it after nationally accepted guidelines such as the National Education Technology Standards (NETS). However, while it is important for school leaders to take the initiative, the role of teachers in tech-oriented classrooms cannot be left out, since becoming technologically literate has been found to be quite unsettling for teachers (Metiri Group, 2004; NCREL, 2004).

In investigations conducted by Hausfather (2002, 2006) on technology integration in teacher education programs, he found that among pre-service teachers (a) technology tends to make tasks more complicated for teachers, causing limits in their ability to

incorporate technology into teaching, (b) teachers wanted to explore the use of electronic communication, distance learning, and Internet access, (c) the physical environment and the server at the colleges curtailed their focus on distance learning and on using the Internet in the classroom, and (d) many college classrooms were not equipped with multimedia hookups, and the computer labs were not equipped to handle the extra traffic brought by teachers' classrooms (Hausfather, 2002, 2006).

Brown and Warschauer (2006) found that technology plays a peripheral role in teachers' preparation experiences, with insufficient student exposure to technology integration. However, a positive shift in student attitudes toward technology use can occur when the mentor teacher in technology at the field placement site encourages integration of technology into the classroom (Brown & Warschauer, 2006, p. 559). Some researchers also found other factors and documented a broad range of issues relating to faculty use of technology. They also found related issues throughout credential coursework and pre-service teachers' experiences in all aspects of teacher preparation programs, including the fact that field placements have contributed to integration of technology (Adamy & Boulmetis, 2006; Best, 2002; Brown, 2003; Dennen & Spector, 2007).

Despite the latest progress in integrating technology in teaching and learning, Brown and Warschauer (2006) argued that "there is continuing demand to better prepare pre-service candidates for teaching in the information age" (p. 560). Toprakci (2006) has identified numerous barriers to teachers' use of computers or technology in the classroom. These include variables such as limited budgets, limited technical support, limited training in integrating technology, low numbers of computers in the school,

slowness of the network, scarcity of educational software in the school, low levels of interest, low levels of training of the teachers and principals in the school, and low levels of openness to changes by teachers and principals in the schools.

Funding

The key to the problems mentioned above may relate to budgetary and funding issues. Persselin (2006) stated that "new product, service, or technique must show to be both technically reliable and cost effective if it is to be attractive and acceptable" (p. 69). Funding remains a key obstacle for schools wanting to implement additional technologies (Schaffhauser, 2008). Improving one area of technology requires improvement in other supplementary and complementary areas, including access control and related security issues. Therefore training, maintenance, and security go together with hardware and software for the establishment of an effective quality integration of technology in schools.

Because effective use of technology must be supported by significant investments in hardware, software, infrastructure, professional development, and support services, over the last decade, the United States has invested more than $66 billion in school technology (Quality Education Data, 2004, p. 20). Judson believes funding was always an issue (Judson, 2006, p. 581) for all aspects of the technology needs for schools.

In a first-of-its-kind survey, the Greaves Group queried more than 900 school administrators about technology needs. The result, *America's Digital Schools 2006*, is a comprehensive look at how schools were adapting to the new world their students inhabit and how they are going to fund it. Below are key findings from the report. Schools report that student development will grow from $19.60 per student in 2006 to $25.02 per student

by 2011. Schools report spending $15.45 per student in 2006 on instructional networks. This will grow at a moderate rate of 10.7% to $25.20 per student by 2011. With these expenses included in administrative and instructional technology costs, the results show that instructional technology purchases still constitute the lion's share of schools' technology budgets (62%) but that personnel costs (28%) far exceed other administrative technology costs (America's Digital Schools, 2006, pp. 2-5).

Teachers who readily integrate technology into their instruction and those who perceived technology as a powerful learning tool have found that although computer prices have come down, school budgets "are simply incapable of supporting such an enormous expense" (Judson, 2006, p. 582). This, he suggested, can lead to other challenges or constraints.

Scheduling Constraints for Teacher Pre-service Training

In a survey directed by Hung, Tan, and Chen (2006), administrators, trainers, and researchers were asked to respond to the key question: "How do we provide instruction in ways that are most relevant in terms of timeliness, access to information, resources, person, localities, task outcomes and skills?" (p. 20). One answer received from the survey was that with technological advancements in devices, leaders can facilitate learning anywhere and anytime and must not constrain instructional strategies to traditional modes of instruction and delivery.

In the past training was seen as, and sometimes limited to, learners or trainees attending a formal course somewhere. They concluded that the convergence in central locations can be seen from the perspective that the center of focus is no longer the instructional goals conceived by the trainer or instructor but that content and instructions

become the means to an end (Hung et al., 2006, pp. 23-26). Now, with flexible scheduling, teaching and learning can take place anywhere and anytime to enhance skill development for use in the classroom.

Student Skill Levels

Government leaders, ranging from Education Secretary Margaret Spellings (Spellings, 2005), to former Secretary of State Colin Powell (Kagan & Stewart, 2004), have signaled that today's students are not prepared to compete internationally. Education and business leaders have also begun to question whether current assessments focus too much on measuring students' ability to recall discrete facts at the cost of not adequately measuring students' ability to think critically and solve problems (Partnership for 21st Century Skills, 2005), which some researchers assert produce, at best, only illusory student gains (Ridgeway, McCusker, & Pead, 2004).

While many different terms have been used to describe what students need, such as digital literacy, technological literacy, and 21st-century skills, education leaders, nationally and internationally, are beginning to come together around a new common definition of what students need to know, Information and Communication Technology (ICT) Literacy. ICT Literacy reflects the need for students to develop learning skills that enable them to think critically, analyze information, communicate, collaborate, and problem-solve, and the essential role that technology plays in realizing these learning skills in today's knowledge-based society. Representative of the ICT literacy skills are the following six arenas critical to students' success in the workplace (after graduating) (Kay & Honey, 2005):

1. Communicate Effectively: Students must have a range of skills to express themselves not only through paper and pencil, but also audio, video, animation, design software as well as a host of new environments (e-mail, Web sites, message boards, blogs, streaming media, etc.).
2. Analyze and Interpret Data: Students must have the ability to crunch, compare, and choose among the glut of data now available Web-based and other electronic formats.
3. Understand Computational Modeling: Students must possess an understanding of the power, limitations, and underlying assumptions of various data representation systems, such as computational models and simulations, which are increasingly driving a wide-range of disciplines.
4. Manage and Prioritize Tasks: Students must be able to mange the multi-tasking, selection, and prioritizing across technology applications that allow them to move fluidly among teams, assignments and communities of practice.
5. Engage in Problem Solving: Students must have an understanding of how to apply what they know and can do to new situations.
6. Ensure Security and Safety: Students must know and use strategies to acknowledge, identify, and negotiate 21st century risks.

For these reasons, Smith (2007), in Project Tomorrow, reported that institutions have increased technology use in prompting integration of technology into education. Transitioning courses from place-based (on-site) to web-based can be time-intensive and stressful for students and faculty. Web-enhancement can serve as a transitioning technique which, Smith claims, would allow gradual introduction to software applications throughout the semester for both students and faculty. She also suggested that access to faculty and course materials can be facilitated with this technological intervention and that through web-enhancement, students can take an active role in their learning. Web-enhancement can facilitate integration of technology competencies into curricula (Smith, 2007).

Teacher Skill Levels

Koehler and Mishra (2008) argued that for effective technology integration, teachers should possess all three knowledge elements (content, pedagogy, and technology) in a dynamic equilibrium. Niess (2005) supported this by introducing and describing TPACK as the "integration of the development of knowledge of subject matter with the development of technology and of knowledge of teaching and learning" (p. 511) According to Niess (2008), TPACK is

> a way of thinking *strategically* while involved in planning, organizing, critiquing, and abstracting, for specific content, specific student needs, and specific classroom situations while concurrently considering the multitude of twenty-first century technologies with the potential for supporting student learning. (p. 224)

However, Niess (2008) argued that TPACK is a way of thinking rather than a knowledge base.

Nevertheless, literature also showed that the role of teachers in tech-oriented classrooms has been found to be quite unsettling for teachers. For instance, research by Hausfather (2002, 2009) on technology integration in teacher educational programs found that the physical environment and the servers at the colleges curtailed teachers' focus on distance learning and using the Internet in the classroom. He also found that many teacher education college classrooms are not equipped with multimedia hookups, and that computer labs are not equipped to handle the extra traffic their classrooms brought (Hausfather, 2002, 2009). This may be due to a lack of administrative vision and planning.

Hausfather (2009), in an analysis of the stories of faculty members integrating technology across the curriculum in a teacher education program, revealed four themes that cut across all the narratives. He suggested that commitment toward change describes the background attitudes and beliefs that propelled teachers to explore changes to their

practice as teacher educators. Second, obstacles to using technology involved challenges in the teaching and learning environments where teachers attempted these changes. Third, struggles in using technology within instructional contexts deal with shared pedagogical concerns. Finally, attitudes toward technology use outline shifting understandings and their effect on teachers' attitudes as teacher educators (Hausfather, 2009). These may have impacted teacher educators with a desire for change.

Bin-Taleb (2005) said "teachers' lack of skill for implementing a program or monitoring effectiveness of integration, and their inability to assess students' computer capabilities and provide remedial computer instructions are major barriers to integration of computer technology as a pedagogical tool" (p. 24).

An Unfocused Vision

Based on the results of data analysis done by Park et al. (2005), barriers such as lack of feedback, rewards and incentives for implementation, and misalignment of vision between teachers and administration created difficulties for teachers trying to plan and integrate technology in the classrooms. The lack of vision-sharing can create problems since school administrators and support faculty prioritized the vision differently. They reported that while support faculty focused on performance and the use of technology in order to move towards student-centered learning (with no feedback or incentives from administrators), school administrators emphasized planning, implementation, and the impact of acquisition cost on the availability and use of technology for the same purpose (Park et al., 2005).

Park et al. (2005) also found that a number of teachers expressed confusion and frustration in vision-sharing. One teacher said, "I'm not sure what administrators are trying to accomplish" (Park et al., 2005, p. 2040).

Teachers' Reluctance to Learn New Technology

Although research shows that schools are generally providing technology resources to support learning in classrooms, Clark (2006) stated that "it has not had the impact that was hoped for" (p. 322). Several trends of prior research suggest that this lack of progress may be due to several factors: (a) funding, (b) scheduling constraints, (c) student skill levels, (d) teachers' skill levels, (e) unfocused vision between teacher and administrators, and (f) teachers' reluctance to learn and/or adopt technology in the classroom (Adamy & Boulmetis, 2006; Park et al., 2005; Trentin, 2006; Whitehead et al., 2003). For this research, these major hindrances were investigated and the four areas selected were student skill level, teachers' skill level, unfocused vision, and teachers' reluctance. These were selected to determine if there was a correlation between the perception of students and teachers in computer technology use in and out of the classroom.

Factors That Provide a Focus for This Study

This study examined six major contributors to the widening gap that could impact interaction. Watkins (2009) suggested that today's students are "really the first generation of teenagers who grew up with the household computer and the Internet as a kind of everyday experience and everyday technology in the household" (p. 5). Watkins continued to say that "they're used to a much more active way of engaging their environment, a much more active way of gauging the information landscape" (p. 5).

Literature also shows that integration issues in and out of the classroom are not only with teachers but also with students in the schools. Unlike teachers, students seem to be more involved in the process of integration. Previous research can verify this; Coufal (2002) noted that students have been observed to be far more skilled at applying digital multimedia than the teachers who have been teaching them. Classroom practice, more often than not, does not come up to student anticipation particularly in the sphere of amalgamation and use of multimedia (Coufal, 2002, pp. 29-30).

Thomas (2008) stated that when it comes to today's kids and their use of technology, a news report sponsored by the British Library and the Joint Information Systems Committee reveals some very interesting results. The biggest shock to many will be one that is actually quite obvious to those who work in education. "Today's students are anything but masters of the technology universe. In fact the report casts major dispersions on the view that teens are better with technology than are older adults" (Thomas, 2008, pp. 283-285). Reporting on the study, Thomas (2008) said the "study sought to determine just how good young people were with information technology and thereby determine what schools and libraries should in turn focus on when teaching students" (p. 283).

Research from Lemonnier, Hamers, Huot, and Parks (2003) showed that, in addition, the use of multimedia and advanced digital technology has the potential to revolutionize the classroom learning experience in several ways. Morris, Shin, and Soloway (2007) pointed out that "early adopters pick up on the technology because they see that technology affords them an opportunity to make a major improvement in a practice or activity" (p. 6).

Windham (2005) revealed that although computers have, at times, been hailed for their potential to revolutionize teaching practice, recent research suggests that change is a complex matter and may be related to such factors as the materiality of the tool itself (its affordances), as well as the way it is ultimately adopted or rejected by individuals in specific social settings (Windham, 2005). Morris et al. (2007) stated that "schools are stepping up their demand for technology. Parents recognize that if children don't use technology in schools then they aren't being properly prepared for future employment" (p. 9). This was and remains a concern for parents and educators.

Similar views have been expressed in literature by Rose and Meyer (2006), showing that "progress has been made of late in the use and interest in incorporating multimedia or advanced digital technology into schools" (p. 56). This, they believe, will support student learning when it provides multiple, flexible methods for student action, expression, and apprenticeship. Nevertheless, other studies suggest that a lack of teacher preparation in educational technologies has hindered implementing technologies in actual classrooms at every level (Fox, 2006; Mitchell, 2003). In the early stages of computer technology in schools, many authors have made attacking the use of technology in schools their personal mission, and some have important messages about technology use in schools. Two such authors are Cordes and Miller (2002) who suggested the following:

> In the early grades, children need live lessons that engage their hands, hearts, bodies, and minds—not computer simulations. Even in high school, where the benefits of computers are clearer, too few technology classes emphasize the ethics or dangers of online research and communication. Too few help students develop the critical skills to make independent judgments about the potential for the Internet or any other technology to have negative as well as positive social consequences. (p. 5)

Earlier research by Cordes and Miller (2002) suggested the need for student engagement with technology from an early age, but did not suggest at what age and to

what extent the use of hands, hearts, bodies, and minds can be manipulated into the process of integration with technology as an alternative to simulations (p. 5). Current research by Morris et al. (2007) suggested that educational technology is finally entering its Golden Era. Morris et al. stated, "While there will still be missteps, well designed technology-based products will be produced that can and will cross the chasm and be used by mainstream teachers benefiting our children enormously and creating an exciting and motivating work environment for educators" (p. 9).

Another argument made against the use of computers in the classroom was by Cuban (2006), who argued then and now states that when teachers are not given a say in how the technology might reshape schools, computers are merely "souped-up" typewriters and classrooms continue to run much as they did a generation ago. In Cuban's studies of early childhood, high school, and university classrooms in the Silicon Valley, he found that students and teachers use the new technologies far less in the classroom than they do at their place of residence, and that teachers who use computers for instruction do so infrequently and unimaginatively (Cuban, 2001, 2006).

At the time, Cuban seemed to be arguing that students and teachers may not have training that could help them utilize technology in the classroom. Jones (2001) supports "training and proactive participation into the planning and implementing of technology in the school" (p. 36), although his earlier research findings did not show or suggest the extent and frequency of the involvement by teachers. Current research by Hegedus (2007) shows that "most classrooms have computers that are connected to the Internet so that students can access information inside or outside of their classroom environment . . . creating new possibilities for learning and teaching" (p. 22).

Other critics in the past identified the failings of administrators in maintaining technology systems as a reason for a lack of efficient integration of technology in the classroom and among students and teachers. In *The Flickering Mind*, Oppenheimer (2003) focused on what he sees as the key failings of computers in schools in his times:

> Some issues are not new: the early and excessive concern about 'computer literacy,' too often at the cost of basic literacy. Other issues are familiar but more clearly documented than usual—the inability of school systems to maintain equipment or train teachers once the hardware is in place. (p. 142)

Valdez (2004), in his literature on critical issues, describes Oppenheimer's (2003) views as not giving computer technology in education credit for some benefits: more efficient record keeping, and better ways to reach children with learning disabilities. However, the central message is that computer infatuation has not only drained billions of dollars from more urgent educational needs, but that its misuse actually damages students, turning out a generation of kids with inferior learning and thinking skills (Valdez, 2004, p. 5).

Valdez (2004) also showed that Oppenheimer (2003) pointed out in his findings how the lack of financial, maintenance, and administrative infrastructure has hindered training and the ability of the school system to make technology efficient. Moreover, Oppenheimer (2003) found those same constrictive elements also contravened the expectations of teachers and students in the implementation and integration of technology. His research did not identify some of the problems experienced in the nation's schools and did not identify the perceptions of what hindrances exist for the pre-service teachers in their training programs at training colleges (Valdez, 2004, p. 4).

At present, multimedia technology seems to influence the growth and development of powerful cognitive tools in the place of residence by adults and students,

and this may be spilling over into schools. Research indicates that while there are poor uses of technology in education, appropriate technology use (those that promote academic learning) can be very beneficial in increasing educational productivity (Valdez et al., 2000; Valdez, 2004). In his introduction to the *Visions 2020.2 Report*, Secretary of Education Paige (2005) noted the following:

> In debating the usefulness of technology, schools remain unchanged for the most part despite numerous reforms and increased investments in computers and networks. The way we organize schools and provide instruction is essentially the same as it was when our Founding Fathers went to school. Put another way, we still educate our students based on an agricultural timetable, in an industrial setting, but tell students they live in a digital age.

Visions 2020.2 (2005), in a report on the future of technology, stated that the use of advanced technology by students and teachers "could play a major role in meeting education and training challenges in the years ahead, and help make the U.S. workforce more competitive globally" (p. 24).

The Climate of Technology in Adventist Education Through Profile Studies

Introduction and Brief History

Though primary education for children was advocated by Adventists during the 1850s and 1860s, it was not until the early 1870s that the newly budding Adventist Church began to recognize and develop a denominational school system. The Adventist education system was founded upon the philosophy that students at all levels of schooling possess individuality and should be educated to use their God-given capacities to become individuals of principle, and to be qualified for any position of life (Department of Education, 2009). A founder and promoter of Christian and Adventist education, White

(1903) stated “that [true] education provides more than mental discipline; it provides more than physical training. . . . It strengthens the character” (p. 18).

This counsel may have encouraged the Adventist educators to teach children to be “thinkers, not mere reflectors of other men’s thoughts” (White, 1903, p. 19). Because of the growth and historical development of their education system, that philosophy has maintained the system of education from 1850 to the present day with continuous interest in offering quality education which today would include integrating curriculum with the use of education technology in its schools to enhance teaching and instruction.

The global Seventh-day Adventist educational system now

> includes 7,442 schools, colleges, and universities, with approximately 75,000 teachers and 1,480,000 students. Working in close cooperation with the Education Department directors in the thirteen world divisions, the staff offers services to boards, administrators, and faculty of Adventist colleges and universities worldwide. (Department of Education, 2009)

The North American Division Curriculum Committee (NADCC) has sponsored several studies under the name Profile. This council sponsored a major study of curriculum issues within the North American Division beginning in 1987 and these studies have been conducted at least every 3 years. Since that time, findings from these studies show some interesting results on the climate of computer technology in the SDA education system. Among these studies, key reports have contributed to the literature in this research. This review includes findings from 1993 through 2004.

Profile ‘93

Profile '93 collected data in four broad areas: teaching, testing, technology, and textbooks. In concerns for technology, which surfaced as a preferred topic for in-service workshops, Brantley and Burton (1994) stated “that this concern may

indicate teachers' recognition that technology has become more than a drill, and will affect students' lives in profound ways" (p. 18). Concerning teachers Brantley and Burton stated that "technology has the potential of augmenting teachers' effectiveness and can remove communication barriers between educators who are widely separated geographically" (p. 18).

The profile report revealed that two immediate problems with technology are the initial cost and the training required to help educators use it to best advantage. In answer to the question regarding which type of technology were available to them, Brantley and Burton (1994) stated that responses show nearly all educators stated they had videocassettes; most had micro-computers but few had modems to tap into the networks and fewer still had speaker phones for total classroom communication. Indications are that even the ubiquitous telephone is not used to full potential as a means of orientation, networking, and collaboration (Brantley & Burton, 1994, pp. 17-21).

Profile '95

In Profile '95, respondents were asked what educators and leaders view as the most urgent needs of classroom teachers. Each was asked to select three of the most urgent needs of teachers from a list of seven: spiritual, curriculum, instruction, technology, organizational, assessment, and personal. The top four chosen by teachers were spiritual, curriculum, instruction, and technology. Because teachers were largely unaware of innovations in computer technology, few of them reported implementing anything in these areas. Very few felt proficient in using any of the innovations listed in the survey. Survey respondents were also asked to tell how far they had progressed on the

information superhighway. Few teachers considered themselves sophisticated users. The report stated that a sizable proportion of the respondents were in "low gear," waiting for some way to make their newly acquired equipment and programs educationally productive (Brantley, 1996/1997, p. 16).

Indications are that teachers were not ready to move to the next step of using computers for a wide variety of applications in teaching. The report showed that a great proportion of educators at all levels had access to computers but the proportion of teachers using the Internet was quite low. It appeared from this report that information technology was making a modest impact on the NAD Adventist school system in 1995. Brantley (1996/1997) suggested that as the new millennium approached, Adventist educators must adequately prepare their students for what lies ahead. He argued that Adventist educators have a nodding acquaintance with the computer, but as most are still in "low gear," considerable training is needed to help them use software effectively and regularly in classroom teaching. Brantley concluded that the potential of information networking and exchange was barely being tapped (p. 16).

Profile '97

Technology questions in Profile '97 focused on teachers and their progress along the "information super highway" (Brantley, 1998/1999, p. 29). Brantley indicated that computing power was less expensive in 1997 than prior years. However, much of this potential has not reached the schools. Indications were that educators—even Adventist educators—had not tapped much of the potential of computers for school applications.

Comparing Profile '97 with Profile '95 showed that most NAD educators continued to be "in low gear" on the information highway. The report indicated the

proportion of educators in all groups who say they are in "high gear" had increased, although fewer elementary teachers had shifted gears. The survey findings also showed that a proportion of educators at all levels had access to computers, and that use of International Business Machine (IBM) compatibles was up from all groups, while Apple computers use had leveled off or decreased from 1995 (Brantley, 1998/1999, p. 29).

Profile '97 indicated that more educators had computers and other forms of technology available than in the past. Ninety-two percent of elementary teachers and 96% of academy teachers had a computer printer and almost all used this equipment. The proportion of teachers using the World Wide Web was relatively low. Forty-two percent of elementary teachers and 69% of academy teachers had Web capability. Nearly half of elementary teachers in this 1997 survey did not have or use the Internet or email (Brantley, 1998/1999, p. 29). Related research by Davidson (1996) supported the increased presence of computers in Adventist schools but low usage by Adventist teachers. Davidson stated that "large number of teachers, while having access to computers, did not use them in the classroom setting" (p. 74). However, Davidson suggested that the user of computers had not risen as rapidly as many had expected and desired. School administrators were wondering what could be done to increase the educational use of computers in their schools (p. 74).

Brantley (1996/1997) argued that information technology was making only a modest impact in NAD schools and classrooms. Although the hardware was present, teachers needed to learn how to use it for a wide variety of practical educational applications (Brantley, 1996/1997, p. 16). Davidson (1996) stated that during this time, "schools were spending large sums of money to purchase computer equipment, and more

money was spent on training teachers (p. 74). Davidson (1996) contributed three recommendations for improving the use of computers in Adventist schools. School boards, he suggested, can provide software that teachers feel comfortable in using, literature that helps teachers visualize what can be accomplished by their use of computers in their classrooms, and training so teachers can learn how to implement the ideas that they visualize (Davidson, 1996).

Profile '99

Data from Profile 1999 showed that teachers had advanced compared to previous years; statistics show that a sizable proportion of teachers were still "in low gear," although Brantley and Hwangbo (2000) did not say what the percentage was. In addition, almost all NAD teachers had access to personal computers. Nearly twice as many elementary and academy teachers were using the World Wide Web as compared to those in 1997. The challenge teachers then faced was finding methods to integrate all this potential in their classroom teaching.

Brantley and Ruiz (2001/2002) made three interesting recommendations in their report:

1. Need for collaboration and teacher interchange to promote professionalism and avoid burnout.
2. Creative use of electronic resources to enhance teaching and learning and pursue a variety of ways to network with their colleagues, including email, Internet chat sessions, and teacher study groups.
3. Administrative help for teachers to become proficient in using computer technology for advanced educational applications. (pp. 21-24)

Profile 2001

This report showed that 37% of Seventh-day Adventist Union leaders rated using technology and distance education as a high priority to reach students, while 69% of them felt that lowering the cost of Adventist education was a higher priority. Teachers

indicated in 2001 that they had much greater access to information technology than in the past (Brantley & Ruiz, 2001/2002).

Since 1995, each Profile study had asked Adventist educators to indicate where they were on the information highway. The percentage who indicated that they were "still in the Driveway" had declined during this 6-year period. By 2001, 7 in 10 teachers now used the web regularly; 9 in 10 used a computer with a printer, but less than a third of all K-12 teachers used the computer for a wide variety of teaching applications (Brantlley & Ruiz, 2001/2002, pp. 21-24). Recommendations from Profile 2001 suggested the importance of planning and recommended that plans should address the increasing role of technology and the necessity of ensuring that every Adventist educator be included as a curriculum development partner in integrating technology in his or her work (Brantley & Ruiz, 2001/2002, pp. 21-24).

Profile 2004 Final Report

In Profile 2004 FR (Final Report), educators were asked about their understanding **of** educational technology as a Preferred Practice as defined in the just-realized Journey to Excellence document (J2E, 2004, p. 18). The report stated that "the Journey to Excellence" report was intended to cast a vision for Adventist education well into the 21st century. The report also showed that almost one fourth of the teachers said they had never heard of technology as a Preferred Practice, while a similar number of teachers indicated that they regularly used educational technology as a Preferred Practice (Burton, Gittens-St. Juste, & Davidson, 2006/2007).

Educational Technology

By 2004, the extent to which educational technology and equipment were available in Adventist schools and classrooms for instructional and communication purposes had grown as compared to earlier studies (Burton, McGarrell, Gittens-St. Juste, & Nwosu, 2005). Burton et al. reported that in both elementary and secondary schools the most common technology available to both teachers and students appeared to be computers, printers, and Internet access for teachers and students. Computers were mostly classroom-based in elementary schools, while they were mostly lab-based in secondary schools, a pattern unchanged since Profile '93 (Burton et al., 2005). Moreover, they reported that more than three quarters of the teachers in elementary schools affirmed that computers, printers, and Internet access for teachers were available in the classrooms, while the same percentage or more of secondary school teachers reported these were available in computer laboratories (Burton et al., 2005).

Computers were used mostly for word-processing, Internet access, and email. Less than half of the teachers used them for Power-point presentations. In addition, they were rarely used for developing Web Quest or Teleconferencing/Web conferencing. It can be concluded from the Profile 2004 report that progress has been made since 1999 in terms of technological availability and use. By 2004, educational technologies and equipment were quite readily available in classrooms and schools. However, they appeared to be under-utilized for instruction/communication. This should continue to be a topic for professional development in the K-12 arena (Burton et al., 2005).

Integrated Curriculum

In responding to a question regarding the integration of computers and multi-media in the classroom to assist learning as a Preferred Practice in Adventist education, the 2004 Profile report showed that almost one fourth of the teachers said they had never heard of it. A similar number of teachers indicated they had regular use of integrating computers and multi-media in the classroom to assist learning as a Preferred Practice (Burton et al., 2005).

Funding/Finances

In Profile 2004, one of the research questions asked how the financial status of the school impacts a teacher's availability of technology. Of the 426 respondents, 218 (51%) revealed that the "financial status of their school had a great effect on availability of technology" (Burton et al., 2005, p. 46). General response patterns showed that the "availability of new technology, competitiveness of the school's program, and the number of students from the constituency who attend NAD schools" are significantly affected by the "financial status of schools in [the] North American Division" (Burton et al., 2005, p. 46).

Profile 2004 also indicated that if parents' perceptions are similar to those expressed here by teachers, then this financial impact on school quality might nudge some parents to pursue alternative educational institutions for their children (Burton et al., 2005).

The NetDay Speak Up Survey Model

NetDay began as an initiative to connect schools to the Internet. Since its founding, the NetDay staff has worked directly with highly challenged communities to develop new models for effective technology integration within education. NetDay (2004) claims that, in working with students, they observed firsthand the power and impact of technology on students' lives, both in school and in their personal time.

In 2005 NetDay merged with Project Tomorrow, a regional nonprofit in Orange County, California, with a successful track record of adopting and promoting innovative approaches to science education. The enlarged organization, still called Project Tomorrow, has a focus on promoting science, math, and technology use by students and teachers and to begin to explore opportunities to promote science learning. This new organization produced its special report called *Visions 2020.2* in collaboration with the U.S. Department of Commerce, the U.S. Department of Education, and NetDay's Speak Up to the President. This report provided data to plan new professional development strategies or to develop ways for students' and teachers' voices to be included in local decision making (Project Tomorrow, 2006, p. 3). *Visions 2020.2* identified potential technologies, their application for learning, and how the learning environment would need to change to take full advantage of them (*Vision 2020.2*, 2005, p. 4).

A key activity of NetDay that emerged over the years is a series of annual surveys, labeled Speak Up. NetDay has conducted several studies and the data gathered have provided information of interest to schools, districts, governments, parents, teachers, and students (NetDay, 2004, p. 2). NetDay Speak Up annual surveys (2005) have created

a framework for conversations to take place in classrooms, in schools, and in communities about the role of technology in education.

NetDay Speak Up initiatives has three general goals:

1. To collect national data about what students and teachers think about education and technology.
2. To raise awareness about the importance of including students' and teachers' voices in national and local discussions on education and technology.
3. To stimulate local conversations about the role of technology in learning and workforce preparedness. (NetDay, 2006, p. 35)

In 2005, NetDay collected data from 185,000 students and 15,000 teachers. Findings were shared with decision-makers in the United States Department of Education; members of Congress; and federal, state, and local policy-making groups in order to inform them of their work (Project Tomorrow, 2006, p. 2). The 2005 NetDay study was based on literature from the previous year's NetDay Speak Up (2004) study, and addressed seven questions relating to perception:

1. How are students and teachers using technology in their work lives?
2. How are students and teachers using technology in their personal lives?
3. How are students and teachers envisioning technology as a means by which they might improve educational opportunities for all students?
4. Who are today's students in terms of technology familiarity, proficiency and habits of use?
5. How are students using technology to help with their schoolwork?
6. How are students using technology in their free time?
7. How would students and teachers like to see technology used in their schools to improve their learning opportunities? (p. 5)

The NetDay questionnaire was designed using these and other questions for both students and teachers.

One key question targeted students' perceptions of methods to achieve the success they desire. The findings listed by NetDay (2006) are listed below: Students want more control over what technology they use and when they use it. The greatest obstacle

students find in using technology was rules against cell phones, email, or IM accounts. The next was “teachers control when we use the computers” (NetDay, 2006).

Limited access to the internet and limited use of technology also rate high as obstacles: (1) “slow Internet access”; (2) “school filters and firewalls”; (3) “not enough time in the day”; and (4) “not enough computers, computers do not work regularly” (NetDay, 2006). If students could be the principal for one day, the first thing they would do is purchase more and better computers and equipment and change the rules about using communication devices at school.

Students know the value of portable technology. Student said the first thing they would do if they were “designing a new school for students just like them” would be to provide laptops for every student that could be taken to the place of residence. The second would be to provide fast, wireless Internet access throughout the school (p. 36).

NetDay (2006) prepared and conducted surveys among teachers since they had key insights into the impact of technology in the classroom and its possibilities for success. The responses to these questions were listed in NetDay’s literature:
Teachers said that technology is having a positive impact on their teaching and on their students’ success. Forty-seven percent of teachers said they are not sure if students are receiving the type of science and math instruction that will help them successfully learn 21st-century skills (NetDay, 2006).

Teachers will always need more time, but issues related to technology access follow at nearly the same rate of importance. The greatest obstacle teachers face in using technology at school for professional tasks is lack of time in the school day. Other obstacles were not enough computers, lack of time for planning, not all students and

families have computers at their place of residence, computers do not work regularly, and slow or unreliable Internet access (NetDay, 2006, p. 8).

NetDay Speak Up surveys from 2003 to 2005 also addressed the perception of respondents' "savvyness" with technology. The authors of the reports say that tech-savvy students: (a) feel strongly about the positive value of technology and rely on technology as an essential and preferred component of every aspect of their lives, (b) not only use technology differently today, but are also approaching their lives and their daily activities differently because of technology, (c) become more sophisticated in technology use as they get older (comparatively, the younger students are on a fast track to becoming greater technology users and advocates), (d) are ultra-communicators, and (e) highly developed ideas about how technology can be used more effectively within their education. These students want to share their ideas with the appropriate decision-makers to affect real change (NetDay, 2005).

The focus of the surveys has shifted a bit over the years; NetDay Speak Up 2006 was centered on giving a voice to the users of technology. NetDay Speak Up 2007 through Speak Up 2009 centered on social networks, virtual computing, and the impact of technology on the users.

CHAPTER 3

METHODOLOGY

Overview

The purpose of this study was to investigate the perceptions of 11th- and 12th -graders and pre-service teachers who are currently enrolled in a teacher education program in regard to the use of technology in a selected Union Conference of the Seventh-day Adventist education system. Specifically this investigation explored the perceptions of pre-service teachers in two teacher education programs and the perceptions of senior high-school students preparing to enter college or the workplace, and to determine their advanced technological abilities in and out of the classroom.

The following areas are addressed in this chapter; (a) research design, (b) population and sampling, (c) instrumentation, (c) content validity, and (d) data analysis.

Research Design

This study used the survey research design method to examine the perceptions towards the use of technology, in which questionnaires were self-administered. The questionnaires gathered information related to the status of technology use by pre-service teachers and 11th- and 12th-grade students in a selected Union. Several studies that investigated students' and teachers' perceptions of technologies used in the education system have used survey research designs to obtain information from students and

teachers (NetDay, 2004; Intel, 2004; PEW Research, 2004). It was appropriate to use this survey research design to collect information for this study, as surveys are used to learn more about people's perceptions and attitudes towards some desired characteristics (Trochim, 2006, p. 12). In most instances, surveys attempt to capture attitudes or patterns of past behavior. Surveys are also used in educational settings because pertinent and accurate information can be obtained from a relatively small sample drawn from a large population (Aday & Cornelios, 2006). Data collected through surveys, including descriptive information, were used to explore relationships between variables (Aday & Cornelios, 2006).

Population and Sampling

In the NetDay (2005) study, a multistage sampling design was used which consisted of the following stages: (a) selection of a geographic area; (b) selection of schools drawn from public and non-public schools within the selected area, and (c) selection of students within the schools that were chosen. The current study used a similar approach to this three-stage strategy indicated above: (a) selection of a Union Conference from the nine Unions in the North American Division of Seventh-day Adventists; (b) random selection of schools randomly drawn from the boarding and day academies within the selected Union; (c) selection of all students in 11th and 12th grades from the randomly selected schools. By default all senior-year pre-service teachers from teacher education programs in the selected Union were included in this study. Each stage of this multistage sampling procedure is described in detail below.

Selection of a Union Conference

For this study, only Union Conferences that had two teacher education programs

located within their multistate regions were considered for inclusion in the study so that comparisons could be made between these programs. Only two Union Conferences satisfied this criterion from the nine Union Conferences in the North American Division of Seventh-day Adventists. To determine which of these two Unions Conferences to select for the study, their names were placed in a container and the first one randomly picked was selected for this study. The non-selected Union Conference would be used only if the first chosen Union refused to take part in the study.

Random selection was used for choosing the Union Conference for this study to ensure that the population sample selected was unbiased. Wiersma (1991) indicated that using such a sampling technique was as simple as using a hat where each school in the population was placed inside and each has an even chance of being chosen. This sampling technique will provide valid results from the population, since it addresses the aspect of external validity (McMilan & Schumacher, 1997).

The first randomly selected Union Conference was contacted in May 2006 through a formal letter to the Union Education Director (see Appendix A). This letter outlined the study and sought permission to use the Union for the study. Permission was granted in September 2006 when the leadership team of the Union agreed to participate in the study. Since the first Union granted permission, the second Union Conference chosen for the study was not contacted.

Selection of the Schools in the Union Conference

The officials in the selected Union provided a list of all academies and teacher education programs within their region. The list provided vital details such as enrollment, contact information, and administrators. There were 765 11th- and 12th-graders enrolled

in 7 schools in the selected Union Conference. The schools were given the following labels: (a) School A, (b) School B, (c) School C, (d) School D, (e) School E, (f) School F, and (g) School G. These labels were given to maintain the anonymity of these schools as pre-condition for conducting this study. For this study a sample of 300 students was selected seeing that "precision increases steadily from a sample size of 35 to about 200 and after 300 there is only a modest gain into increasing the sample size" (Fowler, 1993, p. 43).

Since it was not feasible to randomly select students from all classrooms represented in the population, intact Grade 11 and 12 classes from randomly selected day and boarding schools were included in the sample. Administrators are more likely to allow intact groups to be sampled than individual students from various groups (Fowler, 1993). All secondary schools were: (a) listed with the number of 11th- and 12th-graders currently in those classes; (b) these were then put in two separate containers labeled day and boarding schools; and (c) the selection began by drawing from the containers until the total number of students required for sampling had been met. These school names were not replaced in the containers after being picked out from the container one at a time; drawing continued one after the other until the total number of students was met for the sample. For the purpose of this study, these students were chosen for the population.

The Adventist universities that had teacher's education programs in the chosen Union Conference were contacted in May 2006 with a formal letter to the Deans of these programs. The letter outlined the purpose of the study and sought permission to use all pre-service seniors for this study. Permission was granted in January 2006 to proceed with the study of all education majors graduating in May or August 2007. By default, all

senior education majors were included in this study for these two programs, labeled Tertiary A and Tertiary B. Twenty-seven students received surveys: 15 for Tertiary A and 12 for Tertiary B.

Table 1 shows the number of students and schools selected to participate in this study.

Table 1

Enrolled and Participating 11th- and 12th-Graders by School Type in a Selected Union (*N* = 191)

School	School Types	Enrollment
A	Day	24
B	Boarding	78
C	Day	42
D	Boarding	69
E	Day	56
F	Boarding	67
G	Day	41
Total		377

Instrumentation

Two questionnaires were used in this study. They were: (a) a questionnaire for measuring students' perceptions of the teaching and learning process in the use of multimedia and emerging digital technology, and (b) a questionnaire for measuring pre-

service teachers' perceptions of their use of multimedia and emerging digital technology. The items on the questionnaires were adopted from a number of studies (Bergeson, 2002; NetDay, 2005; Pew, 2004) that investigated the perceptions of the teachers and students.

Description of Instruments

The students' questionnaire designed for this study consisted of 12 items of which 7 provided information on the demographics of the student, and the remaining 5 provided information on the students' perceptions of their use of technology in their place of residence and in school. Most of the items in the instrument used a variation of the selected-response format using a Likert scale. The items addressed in the student questionnaire were: (a) demographic, (b) use of technology at school, (c) use of technology at place of residence, (d) use of technology in subject areas at school, (e) use of the Internet in general, and (f) obstacles experienced in using technology at school.

Development of the Student Questionnaire

The following items were noted and defined by NetDay for the 2005 survey used in government schools nationwide:

1. Demographic, Relating to the Students
2. Use of Technology
    a. Technology Products Use in School
    b. Technology Products Used
3. Technology Use in the Classroom
    a. Used in Subject Areas at School
    b. Use of the Internet

c. Obstacles Faced in Using Technology at School.

The following criteria were noted and defined by the Technology Foundation Standard for Students (TFS-S). A student would be considered as having advanced technological ability when (TFS-S, 2004):

1. The student will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community and workplace through Technology Student Association.
2. The student will safely use tools, materials, equipment and other technology resources.
3. The student will develop an understanding of the characteristics and scope of technology.
4. The student will understand the meanings of invention and innovation.
5. The student will understand the roles that technology and society play in the problem-solving process.
6. The student will recognize the core concepts of technology.
7. The student will understand design and other problem-solving techniques.
8. The student will describe how various inventions, innovations and designs have impacted society.

Table 2 shows the domain-to-item matrix for items used in the students' questionnaire to measure each criterion established by NetDay. The items used in the students' questionnaire were adopted from a number of studies: NetDay (2004, 2005, 2006); PEW Research (2004); Intel (2004); the North American Division of Seventh-day Adventists Profile Study, NADCC (Burton et al., 2005); and Project Tomorrow (2007). In the study, the validity of the students' questionnaire was achieved by using items that were designed to measure the various domains related to the criteria established in NetDay (2004).

Development of Pre-service Teachers Questionnaire

The teacher questionnaire designed for this study consisted of a total of 16 items of which 6 provided information on the demographics of the pre-service teacher; the

Table 2

Domain-to-Item Matrix for the Students' Questionnaire

Criteria	Domains	Items
Use of Technology	Technology Products Used Regularly at School	Desktop Computers Laptop Computers Cell Phone PDA Digital Camcorder Scanner CD Burner MP3 Player Cell Phone PDA
	Technology Products Used Regularly at Place of Residence	Digital Camcorder Scanner CD Burner MP3 Player I-Pod Type Devices
Technology Use in Class	Effective Use of Technology in Class	English Math Science Social Studies/History Foreign Language Art Music Physical Education Yearbook or Newspaper Career or Job Training
	Using the Internet	Write Reports Get Help Visit Websites Setup by the School Create a Web Page Use IM to Talk to Classmate Contribute to a Web Blog Email a Teacher Check on a Class Grade Use an Online Textbook Download Study

remaining 10 provided information on their perception on the use of technology in the place of residence and in the school. Most of the items in the questionnaire used a variation of the Likert scale. The domains addressed in the teachers' questionnaire were: (a) demographic, (b) use of technology on a regular basis, (c) use of technology at work, (d) use of the Internet, (e) satisfaction with technology preparations in school program, (f) prepared to use technology in specific areas, (g) prepared to handle computer security issues, (h) prepared to use technology effectively as a support tool, (i) prepared to use technology to help with teaching, and (j) availability of technology in the work environment.

The items in the teacher questionnaire addressed the following criteria:

1. Demographics: Relating to the Pre-service Teacher
2. Use of Technology
    a. Using Technology to Do Specific Task on a Regular Basis
    b. Technology Product Use in a Typical Week at Work
    c. Using the Internet in a Typical Week at Work
3. Technology Preparation
    a. Pre-service Education to Use Advance Technology in Instruction
    b. Consideration of Self as Well Prepared
    c. Adequately Prepared to Handle Computer Security Issues
    d. Adequately Prepared to Use Software Tools
    e. Adequately Prepared to Use Educational Tools to Help in Teaching
4. Availability for Use at the Institution
    a. Technology Resources Available at School

b. ,Design and Planning to Improve Technology Environment.

Tables 3 shows the domain-to-item matrix for the items used in the teachers' questionnaire adopted from a number of studies (Burton et al., 2005; NetDay, 2004, 2005; PEW Research, 2004; Intel, 2004; Project Tomorrow, 2007). In this study, the validity of the teachers' questionnaire was achieved by using items that were designed to measure the various domains related to the criteria established in NetDay (2004) and by TFS-T (2004).

Pilot Study

A pilot study of the survey was conducted during the spring 2006 semester. This sample included senior education majors from an Adventist teacher education program and students from an Adventist academy in the 11^{th}- and 12^{th}-grade classes in another Union that was not included for this study. The purpose of the pilot was to determine the usability of the instrument in an Adventist educational setting and to establish validity and reliability, seeing that this instrument was never used with students in the Seventh-day Adventist system in its current form.

Respondents were asked to provide feedback on an additional sheet of paper; the feedback was requested to help improve the effectiveness of the surveys, since there was no feedback. However, no changes were made, seeing that no comments were entered on the feedback section; thus, there were no changes made to either of these instruments for use in actual study.

The internal consistency of the instruments was calculated by using Cronbach's alpha and the reliability coefficient obtained for each instrument was $r^2 = 0.86$. According to Santos, Lippke, and Pope (1998, p. 4), it was emphasized that "reliability

Table 3

Domain-to-Item Matrix for the Teachers' Questionnaire

Criteria	Domain	Variables
Use of Technology	Technology Products Used on a Regular Basis	Talk with or Email Friends or Family Members Get Information About Events Shopping Play Games Find Out About Current Events, Sports, Weather Listen to Music Use Graphics, Design, Photo Editing Find Out About Entertain-ment, New Music Learn About Health Look for a Job Update a Personal Web Page Participate in Online Communities, Clubs, Groups Express My Opinion on Discussion Boards Find Out About Volunteer Contact Government Agencies Online Banking Personal Research
Use of Technology	Technology Use in a Typical Week at Work	Desktop Computers Laptop Computers Cell Phone Hand-held Devices (PDA) Digital Camera Video Camera Scanner DVD or CD Burner MP3 Player or IPOD Product Video Game Player Smart Board

Table 3--*Continued.*

Criteria	Domain	Variables
	Using Internet Tools in a Typical Week at Work	Email Listservs Specific Internet Websites Search Engine or Research Sites News Website Instant Massager (IM) Discussion Boards Chat Rooms Web Logs (Blogs) Portal Sites for Education
Technology Preparation	Consider Myself Well Prepared to Use Technology	Productivity Tools Instructional Tools (Student Information) Instructional Tools (Class Management Tools) Integrating Technology Into The Curriculum (General Areas) Integrating Technology Into The Curriculum (Specific Content Areas)
Prepared to Handle	Online Bullying Security, and Social Network Issues	Invasion of Privacy Advertising and Spam Pornography Hacking and Viruses Digital Divide Plagiarism Piracy and Illegal Downloading
Technology Preparation	Prepare to Using Technology Effectively in Teaching and Learning	Keep Records Such as Grades, Word Processing Handouts Research, Prepare and Present Lessons

Table 3–*Continued.*

Criteria	Domain	Variables
		Learning Activities Facilitate Project-Based Participate in Online Professional Development Research Information for Students Conduct Student Assessments Use an Online Content Provider Use a School Content Portal Research Special Needs Research Family and Social Services, Medication Communicate with Professional Update a Class or School Web Page Access the Website of an Educational Association
Technology Preparation	Technology to Help Me Teach	Email-an-expert Online Textbooks Online Classes Subject Specific Websites General Search Engines Database or Online Directory Online Simulations Subject Specific Software Streaming Videos

Table 3--*Continued.*

Criteria	Domain	Variables
Availability for Use at Institution	Technology Readily Available	Enough Computers Working Computers Fast or Reliable Working Internet Access Computers are in a Convenient Location Adequate Software Software or Websites That Supports District Standards Enough Time in School Day Enough Time in Planning Reliable Technology Support Support From Administrators Adequate Knowledge of Use or Integration of Technology
Availability for Use at Institution	Design and Planning for Technology Use	Fast, Wireless Internet Access Throughout The School New Up-to-Date Software A New Computer for Every Teacher A Hand-held Device for Every Teacher Digital Cameras for Teachers to Borrow Video Equipment for Teacher to Borrow A Teacher Computer Lab Scheduled Teacher Development Time for Learning Access to The School Network From Place of Residence. Adequate Technology Maintenance and Support New Computers Throughout The School A Film Studio with Appropriate Software and Equipment A Laptop for Every Student

tests are especially important when derivative variables are intended to be used for subsequent predictive analyses" (p. 4), and George and Mallery (2003) indicated that a r^2 of 0.7 was acceptable (p. 231).

Procedure

Instructions to Principals for Students

Principals for the schools on the list were contacted with a letter of request to participate in the study and were asked to submit a person's name who could be responsible for implementing the survey questionnaire. All principals responded favorably with their willingness to participate and they all gave a person's name who was asked to be proctor for the implementation of the survey when it was sent. Packages containing questionnaire, instruction sheet, permission letter from the union, and research board approval documents were sent subsequently.

The proctors designated to implement the survey were given a procedure sheet with instructions for the students. Students were informed that their responses were voluntary and confidential, and the survey was to be put in an envelope provided for return mailing to me. I was the only individual to access the raw data and had no way of identifying respondents. Pre-teachers were also informed that the data might be used for presentations or papers, but never in raw form.

Instructions to Academies

Students' questionnaires were mailed to principals of nine schools. The schools were asked to distribute the consent forms to the students under 18 years old to take to the parent or guardian for approval signature. A time was set for all students taking the survey to participate. At the end of the survey process in the class, the proctor would then

put the survey in the envelope provided and seal the envelope. The envelope was mailed to me in the pre-addressed and stamped envelope. In all instances the person implementing the survey would have informed the participants that they should not put their name or any personal information on the survey, and that confidentiality would not be compromised.

Instructions to Teacher Education Colleges

Teacher education institutions were contacted through the Deans, via telephone request, to participate in the study and to provide a proctor to implement the survey. The Deans responded favorably to participate and indicated their willingness to provide a proctor to implement the survey. A survey package was sent to the Deans, with the survey material and supporting correspondences. Before participants could access the survey, they were told that taking the survey was an indication of consent to do the survey. Pre-service teachers were informed that their responses are voluntary and confidential, and the survey was to be put in an envelope provided for return mailing to me. I was the only individual to access the raw data and had no way of identifying respondents. Pre-service teachers were also informed that the data might be used for presentations or papers, but never in association with the names of individuals or institutions.

Surveys were administered by the person designated by the department. The person read the instructions to the pre-service teachers in intact classes where the entire process took about 10-15 minutes. Instructions on the survey stated: “Please put a check (√) in the space provided to indicate your best response to the questions below. Do not write your name on this questionnaire” (See appendix A). At the end of the survey

process in the class, the proctor placed the survey in a pre-addressed and stamped envelope provided, and sealed the envelope for mailing. The envelope was mailed to me. In all instances the proctors implementing the survey informed the participants that they did not need to put their name or any personal information on the survey, and that confidentiality would not be compromised.

Data Analysis

This section gives the rationale for using statistical procedures and gives the directions in regard to how the data were analyzed to answer the three research questions under investigation.

Question 1 generated six hypotheses for students' perceptions of their advanced technological abilities in a selected Union Conference of the Seventh-day Adventist education system.

Research question 1: What are the perceptions of high-school students regarding their advanced technological abilities in the selected Union Conference (multistate region) of the Seventh-day Adventist school system?

From this question the following hypotheses were created:

Hypothesis 1: There is a significant difference in students' perceptions by school type in the use of technology products in school by 11th- and 12th-graders in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 2: There is a significant difference in student perceptions by school type in technology products used in school by 11th- and 12th-graders in subject areas (English, Math, & Science) in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 3: There is a significant difference in student perceptions by school type in the use of Internet technology by 11th- and 12th-graders in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 4: There is a significant difference in student perceptions by school type of obstacles in the use of technology resources by 11th- and 12th-graders in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 5: There is a significant difference in student perceptions by school type in students' overall advanced technological abilities by 11th- and 12th-graders in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 6: There is a significant difference based on gender in the overall advanced technological abilities of students by 11th- and 12th-graders in a selected Union Conference of the Seventh-day Adventist education system.

Statistical procedure: An independent sample *t*-test at the 95% confidence level was used to test hypotheses 1–6 to compare the sample means for school types.

Question 2 generated 10 hypotheses for the question relating to pre-service teachers' perceptions of their advanced technological abilities in a selected Union Conference of the Seventh-day Adventist education system.

Research question 2: What are the perceptions of senior pre-service teachers' use of technology and their technological abilities in a selected Union Conference of the Seventh-day Adventist education system?

From this question the following hypotheses were created:

Hypothesis 7: There is a significant difference between pre-service teachers' perceptions by teacher education programs in the use of technology products on a regular

basis at school in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 8: There is a significant difference between pre-service teachers' perceptions by teacher education programs in type of technology products used on a regular basis at their place of residence in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 9: There is a significant difference between pre-service teachers' perceptions by teacher education programs in the regular use of technology products in preparation for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 10: There is a significant difference between pre-service teachers' perceptions by teacher education programs in the use of Internet technology products used on a regular basis as a tool for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 11: There is a significant difference between pre-service teachers' perceptions by teacher education programs where the preparation program has prepared pre-service teachers to use technology tools to enhance teaching and instruction in the classroom in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 12: There is a significant difference between pre-service teachers' perceptions by teacher education programs in the regular use of technology for teaching and instruction in subject areas in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 13: There are significant differences between pre-service teachers' perceptions by education programs in the preparation to use technology for handling software security issues during teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 14: There is a significant difference between pre-service teachers' perceptions by education programs in technology resources and software resources available for use by pre-service teachers on a regular basis for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 15: There is a significant difference between pre-service teachers' perceptions by education programs in the regular use of hardware, software, and technology programs available for pre-service teachers on a regular basis at the institution for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 16: There is a significant difference based on gender in the overall use of technology products and Internet experiences by pre-service teachers in the classroom and out of the classroom for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Statistical procedure: An independent sample *t*-test at the 95% confidence level was used to test hypotheses 7–16 to compare the sample means for school programs and gender.

The independent sample *t*-test evaluates the difference between the means of two independent groups. Each case should have scores on two variables, a grouping variable and a testing variable. The grouping variable divides the cases into two mutually

exclusive groups such as males and females, and the testing variable describes each case on some quantitative dimension such as overall technology-savvy score (Green, 2003). Thus this was the appropriate test to use for analyzing the data in view of the fact that comparisons were being made between school types, school programs, and gender.

Question 3 generated two hypotheses and sought to determine what variables contributed to making students and pre-service teachers have advanced technological abilities in this selected Union Conference of the Seventh-day Adventist education system.

Research question 3: What selected variables contribute to the advanced technological ability of students and pre-service teachers in the selected Union Conference (multistate region) of the Seventh-day Adventist school system?

Hypothesis 17: There are linear relationships between the overall advanced technological ability score and the independent variables of students' perceptions of technology in a selected Union Conference of the Seventh-day Adventist education system.

Hypothesis 18: There are linear relationships between the overall advanced technological score and the independent variables of teachers' perceptions of technology in a selected Union Conference of the Seventh-day Adventist education system.

Statistical procedure: Regression analysis making use of zero-order correlation was used to analyze each of the two hypotheses that are under investigation in research question 3. "This is equivalent to testing the null hypothesis that the population slope is 0" (Norusis, 1997, p. 400). Linear regression analysis allows one to test whether there is a relationship between the independent variables (items under each domain in item-to-

domain matrix) and the dependent variable (overall technology-savvy score). Gay, Rieger, and Bennington (2006) indicated that "relationship studies are conducted in an attempt to gain insight into factors, or variables, that are related to complex variables such as academic achievement, motivation, and self-concepts" (p. 196). This analysis can therefore be considered appropriate for this study, seeing the purpose of research question 3 was to determine the variables that are related to advanced technological abilities.

CHAPTER 4

RESULTS

Overview of Results

This chapter gives an overview of the demographic information of students and pre-service teachers in the selected Union Conference of the Seventh-day Adventist school system and presents the results of the data analysis under the three research questions in this study using descriptive and inferential statistics.

Demographic Information of Students

A total of 191 students participated in this study, representing a return rate of 51%. Table 4 summarizes the demographic characteristics of the students, where a little more than half (56.5%) were females, with less than two-thirds (61.3%) being 12th-graders, and a little more than half (56%) of the students attending boarding school.

Table 5 summarizes the results of the importance of technology for use in school by students where most (98.4%) felt that technology was important to very important in their education; only 3.6% of the day-school students felt it was not important.

Table 6 shows that less than half (39.9%) of day-school students indicated that they are more likely to be using technology at school, and of those responding, about half (50.8%) of the students stated they are most likely to be at school when using technology

Table 4

Frequency and Percentage of the Selected Demographic Characteristics of Students in the Selected Union (N = 191)

Characteristics	*n*	%
Grades		
11	74	38.7
12	117	61.3
Gender		
Male	83	43.5
Female	108	56.5
School Type		
Day	84	44.0
Boarding	107	56.0

Table 5

Descriptive Statistics for Importance of Technology by School Type (N = 191)

	Not Very Important		Important	
	n	%	*n*	%
Boarding School	0	0.0	107	100.0
Day School	3	3.6	81	96.4
Total	3	3.6	188	98.4

Table 6

Descriptive Statistics for Using Technology to Get Help for School Work by School Type (N =191)

Help for Place of Homework	Boarding School		Day School		Total	
	n	%	*n*	%	*n*	%
At Place of Residence	40	37.4	48	57.1	88	46.1
At My School	66	61.7	31	36.9	97	50.8
At the Public Library	0	0.0	4	4.8	4	2.1
At a Friend's House	1	.9	1	1.2	2	1.0
Total	107	56.0	84	44.0	191	100.0

to help with their school work, with more than half (61.7%) of the students in day school indicating such.

Table 7 summarizes the results of where students are likely to be using technology the most when they are at school. Of those responding, less than a half (45.5%) of the students stated they would be in the lab. Of these students, more than a half of the boarding-school students (67.3%) said they would be in the lab. Of the day-school students, more than a half (61.9%) indicated they would most likely be in the classroom.

Table 8 summarizes the results of what students are most likely to be using technology for when they are on their free time while at school. Of those responding, about half (50.8%) of all students stated they would use technology mostly for emailing friends and family as did more than half of the boarding-school students (55.1%).

Table 7

*Descriptive Statistics for Technology Used Mostly at School by School Type (N =*191*)*

Technology Used Mostly at School	Boarding School		Day School		Totals	
	n	%	*n*	%	*n*	%
In a Classroom	12	11.2	52	61.9	64	33.5
Computer Lab	72	67.3	15	17.9	87	45.5
School Library	21	19.6	13	15.5	34	17.8
A Guidance Office	0	.0	1	1.2	1	.5
Do Not Use Regularly in Classroom	2	1.9	3	3.6	5	2.6
Total	107	56.0	84	44.0	191	100.0

Table 8

*Descriptive Statistics for Technology Used Mostly at School During the Students' Free Time at School by School Type (N =*191*)*

How Computers Are Used in Free Times	Boarding School		Day School		Total	
	n	*(%)*	*n*	*(%)*	*n*	*(%)*
Talk With or Email Friends or Family	59	55.1	38	45.2	97	50.8
Play Games	6	5.6	13	15.5	19	9.9
Listen and Download Music	19	7.8	19	22.6	38	19.9
Get Information About Places and Things	9	8.4	2	2.4	11	5.8
Use Only For Schoolwork	5	4.7	8	9.5	13	6.8
None of the Above	9	8.4	4	4.8	13	6.8
Total	107	56.0	84	44.0	191	100.0

Demographic Information of Pre-Service Teachers

A total of 25 pre-service teachers participated in this study, representing a return rate of 93%. Table 9 summarizes the characteristics of the demographics for pre-service teachers, where participants from Tertiary A accounted for 44.0%, while Tertiary B accounted for 56.0%; more than three-fourths (88.0%) of the participants fell between the ages of 18 and 25.

Table 9

Category and Percentage of the Selected Demographic of Students

Characteristics	*N*	%
Pre-service Program		
Tertiary A	11	44.0
Tertiary B	14	56.0
Ages		
18 -21	11	44.0
22 -25	11	44.0
26 +	3	12.0
Gender		
Male	8	32.0
Female	17	68.0
Ethnicity		
African-American	14	56.0
Caucasian	11	44.0
Teaching Levels		
K – 2	6	24.0
3 – 5	10	40.0
6 – 8	3	12.0
9 – 12	6	24.0

More than half (68.0%) of the pre-service teachers participating were female, and more than half (56.0%) were African-American. The majority (40.0%) of the pre-service teachers responding indicated they hope to teach at the 3rd to 5th grade level at the completion of their pre-service program.

Table 10 summarizes the results of what subject areas pre-service teachers were planning to teach in on completion of their program. A little more than half (64%) indicated they intended to teach multiple subject areas in elementary schools on completion of their pre-service teachers program.

Table 10

Frequency and Percentage of the Selected Demographic Characteristics of Pre-service Teachers in the Selected Union (N = 25)

Subject Area Plans for Teaching After Completing Pre-teachers Program	*N*	%
Multiple Subjects (Elementary)	16	64.0
English	2	8.0
Math	1	4.0
Social Studies or History	1	4.0
Physical Education	3	12.0
Other	2	8.0
Total	25	100.0

Table 11 summarizes the frequency and percentage of the selected demographic characteristics of pre-service teachers accessing the internet for professional task in the selected union.

Table 11

Frequency and Percentage of the Selected Demographic Characteristics of Pre-service Teachers Accessing the Internet for Professional Task in the Selected Union (N = 25)

Location: When You Access the Internet For Professional Task	*N*	%
My Classroom	7	28.0
School Library	1	4.0
Teachers' Workroom	1	4.0
Place of residence	13	52.0
A Friend's House	1	4.0
Total	23	90.0

Testing the Null Hypotheses

Question 1 generated seven hypotheses for students' perceptions of their advanced technological abilities in a selected Union Conference of the Seventh-day Adventist education system.

Question 1: What are the perceptions of high-school students' use of technology and their advanced technological abilities in a selected Union Conference of the

Seventh-day Adventist education system? All null hypotheses were tested at the 0.05 level.

Null Hypothesis 1: There is no significant difference in students' perceptions by school type in the use of technology products in school by 11th- and 12th-graders in a selected Union Conference of the Seventh-day Adventist education system.

Table 12 shows the results for the regular use of technology products in schools by students where a little more than half (56%) agreed or strongly agreed that they used

Table 12

Descriptive Statistics for Technology Products Used Regularly by Students at School (N = 191)

	Number and (Percentages) of Responses						
Items	1	2	3	4	5	*M*	*SD*
Desktop Computers	39 (21.0)	19 (10.2)	23 (12.4)	47 (25.3)	58 (31.2)	3.35	1.53
Laptop Computers	49 (26.9)	26 (14.2)	21 (11.5)	21 (11.5)	66 (36.1)	3.16	1.66
Cell Phones	38 (20.5)	18 (9.7)	40 (21.6)	37 (20.0)	52 (28.1)	3.25	1.48
PDA	105 (58.7)	3 (18.4)	26 (14.5)	9 (05.0)	6 (03.4)	1.76	1.09
Digital Camcorder	86 (47.8)	34 (18.9)	35 (19.4)	15 (08.3)	10 (05.6)	2.05	1.23
Scanner	91 (50.0)	41 (22.5)	29 (15.9)	18 (09.9)	3 (01.6)	1.91	1.10
CD Burner	78 (42.9)	38 (20.9)	36 (19.8)	22 (12.1)	8 (04.4)	2.14	1.22
MP3 Player	88 (47.8)	37 (20.1)	18 (09.8)	24 (13.0)	17 (09.2)	2.16	1.38
I-POD Type Devices	89 (48.6)	31 (16.9)	17 (09.3)	21 (11.5)	26 (13.6)	2.30	1.71

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

desktop computers in school regularly. However, less than half (42%) used laptop computers in the classroom regularly. Less than one-fifth of students agreed or strongly

agreed that they used a CD burner (16%) in school regularly, while one-fourth agreed or strongly agreed that they used an i-Pod (25%) in school on a regular basis.

Table 13 shows the mean, standard deviation, and independent *t* test for the use of technology products by school types for students in a selected Union Conference of the Seventh-day Adventist education system. An independent sample *t* test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by school types in the use of technology products at school.

Table 13

Means and Standard Deviation of Total Scale and Composite Scales for Technology Products Used at School ($N = 191$)

	Day			Boarding				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Desktop Computers	84	2.25	1.56	107	4.07	1.10	-9.42	.00*
Laptop Computers	84	3.40	1.85	107	2.73	1.60	2.70	.01*
Cell Phones	84	2.94	1.52	107	3.32	1.59	-1.66	.10
PDA Devices	84	1.46	1.05	107	1.79	1.18	-2.01	.05*
Digital Camcorder	84	1.63	1.12	107	2.17	1.36	-2.92	.00*
Scanner	84	1.57	.99	107	2.01	1.23	-2.67	.00*
CD Burner	84	1.94	1.22	107	2.12	1.32	-.97	.33
MP3 Player	84	1.87	1.30	107	2.24	1.49	-1.82	.07
I-Pod Type Devices	84	1.96	1.20	107	2.38	1.57	-1.66	.10

* $p < 0.05$.

There was a significant difference by school type where boarding-school students ($M = 4.07$, $SD = 1.10$) used desktops more regularly at school than day-school students ($M = 2.25$, $SD = 1.56$). The null hypothesis was therefore rejected.

There was a significant difference by school type where day-school students (M = 3.40, SD = 1.85) used laptop computers more regularly at school than boarding students (M=2.73, SD=1.60). The null hypothesis was therefore rejected.

Null Hypothesis 2: There is no significant difference in student perceptions by school type in the use of technology products in school by 11th- and 12th-graders in subject areas (English, Math, & Science) in a selected Union Conference of the Seventh-day Adventist education system.

Table 14 shows the results of the use of technology products in subject areas by students with a majority indicating usage in social studies/history (64%). Less than half agreed or strongly agreed that they use technology in job-training modules (44%).

Table 14

Descriptive Statistics for Technology Products Used Most Effectively in the Following Subjects Areas at School (N = 191*)*

	Number and (Percentages) of Responses						
Items	1	2	3	4	5	*M*	*SD*
English	16 (08.6)	17 (09.1)	35 (18.7)	67 (35.8)	52 (27.8)	3.65	1.22
Math	58 (31.2)	35 (18.8)	52 (28.0)	22(11.8)	19 (10.2)	2.51	1.32
Science	20 (10.9)	22 (12.0)	40 (21.7)	46 (25.0)	56 (30.4)	3.52	1.33
Social Studies/History	11 (05.9)	13 (07.0)	42 (28.1)	52 (28.1)	67 (36.2)	3.82	1.17
Foreign Language	45 (25.1)	28 (15.6)	46 (25.7)	31 (17.3)	29 (16.2)	2.84	1.40
Art	89 (50.3)	31 (17.5)	32 (18.1)	09 (05.1)	16 (09.0)	2.05	1.31
Music	83 (46.4)	28 (15.6)	35 (19.6)	12 (06.7)	21 (11.7)	2.22	1.40
Physical Education	82 (46.6)	44 (25.0)	35 (19.9)	9 (05.1)	6 (03.4)	1.94	1.09
Yearbook	49 (28.2)	18 (10.3)	29 (16.7)	19 (10.9)	9 (33.9)	3.12	1.64
Job Training	44 (24.4)	18 (10.0)	38 (21.1)	32 (17.8)	48 (26.7)	3.12	1.52

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Table 15 indicates the mean, standard deviation, independent *t* test, and number of cases by school types for students in a selected Union Conference of the SDA education system. An independent sample *t* test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by school types in the use of technology products in subject areas at school. The following results were obtained.

Table 15

Means and Standard Deviation of Total and Composite Scales for Technology Use in School in Subject Areas (N = 191)

	Day			Boarding				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
English	84	3.08	1.47	107	3.96	1.03	-4.85	.00*
Math	84	1.99	1.30	107	2.80	1.30	-4.30	.00*
Science	84	3.39	1.35	107	3.39	1.41	.00	.99
Social Studies/History	84	3.89	1.35	107	3.54	1.30	.81	.07
Foreign Language	84	2.74	1.67	106	2.62	1.38	.52	.60
Art	84	1.61	1.22	106	2.15	1.43	-2.78	.01*
Music	84	1.68	1.29	107	2.39	1.50	-3.46	.00*
Physical Education	84	1.69	1.13	105	1.90	1.18	-3.39	.00*
Yearbook or News Paper	84	2.44	1.78	105	3.22	1.73	-3.04	.00*
Career or Job Training	84	2.25	1.59	105	3.55	1.42	-5.94	.00*

* $p < 0.05$.

There is a significant difference by school type where boarding-school students ($M = 3.96$, $SD = 1.03$) used technology in English at school more than day-school students ($M = 3.08$, $SD = 1.47$). The null hypothesis is therefore rejected.

There is a significant difference by school type where boarding-school students (M = 2.80, SD = 1.30) used technology in math at school more than day-school students (M = 1.99, SD = 1.30). The null hypothesis is therefore rejected.

There is no significant difference in the use of technology for science by boarding and day-school students. The null hypothesis is retained.

There is no significant difference in the use of technology for social studies/history by boarding and day-school students. The null hypothesis is retained.

There is no significant difference in the use of technology for foreign language by boarding and day-school students. The null hypothesis was retained.

There is a significant difference by school type where boarding-school students (M = 2.15, SD = 1.43) used technology in art at school more than day-school students (M = 1.61, SD = 1.22). The null hypothesis was therefore rejected.

There is a significant difference by school type where boarding-school students (M = 2.39, SD = 1.50) used technology in music at school more than day-school students (M = 1.68, SD = 1.29). The null hypothesis was therefore rejected.

There is a significant difference by school type where boarding-school students (M = 1.90, SD = 1.18) used technology in physical education at school more than day-school students (M = 1.69, SD = 1.13). The null hypothesis was therefore rejected.

There is a significant difference by school type where boarding-school students (M = 3.22, SD = 1.72) used technology in yearbook and newspaper assignments at school more than day-school students (M = 2.44, SD = 1.78). The null hypothesis was therefore rejected.

There is a significant difference by school type where boarding-school students

(M = 3.55, SD = 1.42) used technology in career or job training at school more than day school students (M = 2.25, SD = 1.59). The null hypothesis was therefore rejected.

Null Hypothesis 3: There is no significant difference in student perceptions by school type in the use of Internet technology by 11th- and 12th-graders in a selected Union Conference of the Seventh-day Adventist education system.

Table 16 shows the results of the use of Internet technology by students where a majority (93%) of them are using Internet technology for writing reports; however, about half agreed to strongly agreed that they use Internet technology to email a teacher. Less than one-half (48%) of the students agreed or strongly agree that they use Internet technology for online textbook, and a quarter (25%) of the students agree to strongly agree that they use Internet technology for contributing to web blogs.

Table 16

Descriptive Statistics for Technology Products Used While Using the Internet (N = 191)

	Number and (Percentages) of Responses						
Items	1	2	3	4	5	*M*	*SD*
Writing Reports	1 (00.5)	1 (00.5)	8 (04.3)	26 (13.8)	152 (80.9)	4.74	.61
Online Tutor Help	76 (40.6)	57 (30.5)	29 (15.5)	8 (04.3)	17 (09.1)	2.11	1.24
Visit School Website	12 (06.4)	9 (04.8)	25 (13.4)	58 (31.0)	83 (44.4)	4.02	1.16
Create a Web Page	76 (41.1)	41 (22.2)	28 (15.1)	17 (09.2)	23 (12.4)	2.30	1.40
Use IM to Talk	41 (21.8)	33 (17.6)	38 (20.2)	42 (22.8)	34 (18.1)	2.97	1.41
Web Blogs	62 (33.5)	37 (20.0)	38 (20.5)	32 (17.3)	16 (08.6)	2.48	1.34
Email a Teacher	22 (11.8)	22 (11.8)	33 (17.6)	60 (32.1)	50 (26.7)	3.50	1.32
Check on Class Grade	12 (06.4)	5 (02.7)	17 (09.0)	41 (21.8)	113 (60.1)	4.27	1.14
Online Textbook Use	41 (22.2)	27 (14.6)	28 (15.1)	25 (13.5)	64 (34.6)	3.24	1.58
Download Guide	38 (20.3)	25 (13.4)	39 (20.9)	40 (21.4)	45 (24.1)	3.16	1.45

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Table 17 shows the mean, standard deviation, independent *t*-test, and number of cases by school type for students in a selected Union Conference of the SDA education system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by school types in the use of Internet technology product at school. The following results were obtained:

There is no significant difference in the use of technology in writing reports at school by boarding and day-school students. The null hypothesis is retained.

There is a significant difference by school type where boarding-school students (M =1.2.32, SD = 1.34) used technology in getting help at school more than day-school students (M = 4.67, SD = .767). The null hypothesis was therefore rejected.

There is no significant difference in the use of technology for visiting websites by boarding and day-school students. The null hypothesis was retained.

There is a significant difference by school type where boarding-school students (M =2.51, SD = 1.49) used technology in creating a web page at school more than day-school students (M = 1.90, SD = 1.22). The null hypothesis was therefore rejected.

There is a significant difference by school type where boarding-school students (M = 3.28, SD = 1.41) used technology in physical education at school more than day-school students (M = 2.51, SD = 1.37). The null hypothesis was therefore rejected.

There is no significant difference in the use of technology for contributing to web blogs by boarding and day-school students. The null hypothesis was retained.

There is no significant difference in the use of technology for emailing teachers by boarding and day-school students. The null hypothesis was retained.

There is a significant difference by school type where day-school students

(*M* = 4.42, *SD* = .977) used technology in checking on grades at school more than boarding-school students (*M* = 4.07, *SD* = 1.36). The null hypothesis was therefore rejected.

There is a significant difference by school type where day-school students (*M* = 3.76, *SD* = 1.54) used technology in using online texts at school more than boarding-school students (*M* = 2.68, *SD* = 1.57). The null hypothesis was therefore rejected.

Table 17

Means and Standard Deviation of Total Scale and Composite Scales for Technology Use While Using the Internet (N = 191*)*

	Day			*Boarding*				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Write Report	83	4.67	.77	107	4.70	.79	-.23	.82
Get Help	83	1.76	1.09	107	2.32	1.34	-3.10	.00*
Visit Websites	83	3.93	1.36	107	3.98	1.18	-.29	.77
Create a Web Page	82	1.90	1.23	107	2.51	1.49	-2.98	.00*
Use IM	83	2.51	1.37	107	3.28	1.41	-3.80	.00*
Contribute to Web Blogs	82	2.23	1.34	107	2.57	1.39	-1.69	.10
Email Teacher	83	3.42	1.47	107	3.47	1.31	-.22	.82
Check on Grades	83	4.42	.98	107	4.07	1.36	2.01	.04*
Use Online Text	83	3.76	1.54	107	2.68	1.58	4.71	.00*
Download Guide	83	3.45	1.50	107	2.84	1.44	2.82	.60

* $p < 0.05$.

Null Hypothesis 4: There is no significant difference in student perceptions by school for types of obstacles faced in the use of technology resources by 11th- and 12th-

graders in a selected Union Conference of the Seventh-day Adventist education system.

Table 18 shows the results for the obstacles in the use of technology resources at school for students, where a little more than three-fourths (78%) indicated that they face the obstacle of not knowing how to use technology at school and a little more than a third (38%) indicated the computer was working regularly.

Table 19 shows the mean, standard deviation, independent *t*-test, and number of cases by school types for students in a selected Union Conference of the Seventh-day Adventist education system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by school types in the use of technology products at school. The following results were obtained:

Table 18

Descriptive Statistics for Obstacles Students Face in Using Technology (N = 191)

	Number and (Percentages) of Responses						
Items	1	2	3	4	5	*M*	*SD*
Not enough Comp.	35 (18.6)	35 (18.6)	40 (21.3)	39 (20.7)	39 (20.7)	3.06	1.41
Computer Working	24 (12.8)	35 (18.7)	57 (30.5)	51 (27.3)	20 (10.7)	3.04	1.19
Fast Access Time	15 (08.1)	32 (17.2)	53 (28.5)	51 (27.4)	34 (18.3)	3.31	1.19
Teacher Skill	4 (02.2)	22 (12.0)	78 (42.4)	51 (27.7)	29 (15.8)	3.43	.97
I Know How to Use	5 (02.7)	8 (04.3)	27 (14.5)	76 (40.9)	70 (37.6)	4.06	.97
Convenient Location	16 (08.6)	19 (10.2)	45 (24.1)	63 (33.7)	44 (23.5)	3.53	1.20
Update Software	13 (07.1)	32 (17.6)	52 (28.6)	56 (30.8)	28 (15.4)	3.29	1.15
Enough Time in Day	26 (14.0)	35 (18.8)	52 (28.0)	40 (21.5)	33 (17.7)	3.10	1.29

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Table 19

Means and Standard Deviation of Total Scale and Composite Scales for Technology Obstacles at School (N = 191)

	Day			Boarding				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Not Enough Computers	83	2.48	1.49	107	3.46	1.23	-4.94	.00*
Computers Work Regularly	82	2.94	1.25	107	3.07	1.20	-.71	.48
Fast Access Time	81	3.40	1.19	107	3.56	4.14	-.35	.73
Teacher Is Knowledgeable	82	3.30	1.03	104	3.46	1.02	1.03	.30
Know How to Use Technology	82	4.07	1.03	106	3.98	1.07	.60	.55
Computer in Conv. Location	83	3.42	1.31	106	3.56	1.20	-.74	.46
Update Software	84	3.13	1.24	107	3.22	1.57	-.45	.66
Enough Time in School	84	3.08	1.36	107	2.97	1.38	.56	.58

* $p < 0.05$.

There is a significant difference by school type where boarding-school students (M =3.46, SD = 1.23) perceive that not enough computers is an obstacle in using technology at school more than day-school students (M = 2.48, SD = 1.49). The null hypothesis was therefore rejected.

There is no significant difference in the perceptions of boarding and day-school students that computers work regularly is an obstacle in using technology at school. The null hypothesis was retained.

There is no significant difference in the perceptions of boarding and day-school students that fast access time is an obstacle in using technology at school. The null hypothesis was retained.

There is no significant difference in the perceptions of boarding and day-school students that teacher is knowledgeable is an obstacle in using technology at school. The

null hypothesis was retained.

There is no significant difference in the perceptions of boarding and day-school students that knowing how to use technology is an obstacle in using technology at school. The null hypothesis was retained.

There is no significant difference in the perceptions of boarding and day-school students that computers are in a convenient location is an obstacle in using technology at school. The null hypothesis was retained.

There is no significant difference in the perceptions of boarding and day-school students that out-of-date software is an obstacle in using technology at school. The null hypothesis was retained.

There is no significant difference in the perceptions of boarding and day-school students that enough time in school is an obstacle in using technology at school. The null hypothesis was retained.

Null Hypothesis 5: There is no significant difference in student perceptions by school type in students' overall advanced technological abilities by 11th- and 12th-graders in a selected Union Conference of the Seventh-day Adventist education system.

Table 20 indicates the mean, standard deviation, independent *t*-test, and number of cases by school types for students in a selected Union Conference of the SDA eduation system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by school types in advanced technology ability in using technology in special subject areas by students. The following results were obtained.

Table 20

Means and Standard Deviations of Total and Composite Scales for Overall Use of Technology Base on Gender (N = 191)

	Boarding			Day				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Overall Use of Technology	70	71.92	14.19	94	67.62	13.37	.01	.99

* $p < 0.05$.

There is a significant difference by school type where boarding-school students (M = 71.92, SD = 14.19) perceive themselves to be more advanced with technology ability than day-school students (M = 67.62, SD = 13.37) in special subject areas. The null hypothesis was therefore rejected.

Null Hypothesis 6: There is no significant difference based on gender in the overall advanced technological abilities of students by 11th- and 12th-graders in a selected Union Conference of the Seventh-day Adventist education system.

Table 21 indicates the mean, standard deviation, independent *t*-test, and number of cases by gender for students in a selected Union Conference of the SDA education system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significant difference (p = 0.05) by gender in advanced technology ability in using technology. The following results were obtained:

Table 21

Means and Standard Deviation of Total and Composite Scales for Advanced Technology-Savvy Ability of Students Based on Gender (N = 191)

	Male			Female				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Overall Advanced Savvy Abilities	72	70.58	14.46	97	69.55	13.63	.48	.63

* $p < 0.05$.

There is a significant difference by school type where boarding-school male students ($M = 70.58$, $SD = 14.46$) perceive themselves to have more tech-savvy abilities in class with technology than day-school students ($M = 69.55$, $SD = 13.63$). The null hypothesis was therefore rejected.

Research Question 2: What are the perceptions of senior pre-service teachers' use of technology and their technological abilities in a selected Union Conference of the Seventh-day Adventist education system? From this question the following null hypotheses were created:

Null Hypothesis 7: There is no significant difference between pre-service teachers' perceptions, by teacher education programs, in the use of technology products on a regular basis at school in a selected Union Conference of the Seventh-day Adventist education system.

Table 22 shows the results for the use of technology products in institutions where three-quarters (75%) of the respondents indicated that they used technology products to

talk/email with friends on a regular basis. Less than half (48%) disagreed or strongly disagreed that they used technology products to play games and learn about faith, and about one-fifth (20%) of them strongly disagreed that they use technology to do shopping, find volunteer activities, and contact government agencies on a regular basis.

Table 22

Descriptive Statistics for Technology Products Used Regularly by Pre-service Teachers at School (N = 25)

	Number and (Percentages) of Responses						
Items	1	2	3	4	5	*M*	*SD*
Talk/Email with Friends	1 (04.0)	1 (04.0)	1 (04.0)	6 (24.0)	16 (64.0)	4.40	1.04
Get Info. About Events	1 (04.0)	4 (16.0)	4 (16.0)	6 (24.0)	10 (40.0)	3.80	1.26
Shopping	3 (12.0)	9 (36.0)	8 (32.0)	3 (12.0)	2 (08.0)	2.68	1.11
Play Games	4 (16.7)	7 (29.2)	1 (04.2)	8 (32.3)	4 (16.7)	3.04	1.43
Current Events	2 (08.3)	1 (04.2)	1 (04.2)	8 (33.3)	12 (50.0)	4.13	1.23
Listen & Download Music	2 (08.3)	1 (04.2)	6 (25.0)	5 (20.8)	10 (41.7)	3.83	1.27
Use Graphics, Photo	1 (04.0)	6 (24.0)	4 (16.0)	4 (16.0)	10 (40.0)	3.64	1.35
Find out About Entertain	3 (12.0)	6 (24.0)	6 (24.0)	4 (16.0)	6 (24.0)	3.16	1.38
Learn About Faith etc.	3 (12.0)	5 (20.0)	5 (20.0)	6 (24.0)	6 (24.0)	3.28	1.37
Look for or Apply for Job	3 (12.0)	4 (16.0)	8 (32.0)	2 (08.0)	8 (32.0)	3.32	1.41
Update a Web Page	4 (16.0)	4 (16.0)	3 (12.0)	5 (20.0)	9 (36.0)	3.44	1.53
Participate in Online Meet	7 (28.0)	7 (28.0)	3 (12.0)	2 (08.0)	6 (24.0)	2.72	1.57
Express Opinion	9 (36.0)	9 (36.0)	1 (04.0)	2 (08.0)	4 (16.0)	2.32	1.46
Find Volunteer	5 (20.0)	12(48.0)	3 (12.0)	3 (12.0)	2 (08.0)	2.40	1.19
Contact Government Agent	11 (44.0)	5 (20.0)	4 (16.0)	2 (08.0)	3 (12.0)	2.24	1.42
Online Banking	7 (28.0)	4 (16.0)	3 (12.0)	3 (12.0)	8 (32.0)	3.04	1.67
Personal Research	2 (08.0)	4 (16.0)	5 (20.0)	7 (28.0)	7 (28.0)	3.52	1.30

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Table 23 indicates the mean, standard deviation, independent *t* test, and number of cases by pre-service institutions in a selected Union Conference of the Seventh-day

Adventist education system. An independent sample *t* test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by institution type with pre-service teachers in the use of technology. The following results were obtained:

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology to get information to use in school. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for shopping. The null hypothesis was retained.

There is a significant difference in the perceptions of pre-service teachers by institution where Tertiary A pre-service teachers ($M = 3.90$, $SD = 1.10$) play more games using technology than do Tertiary B pre-service teachers ($M = 2.43$, $SD = 1.20$). The null hypothesis was therefore rejected.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for finding out about current events. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for listening to music. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for use in graphics and design. The null hypothesis was retained.

Table 23

Means and Standard Deviation of Total Scale and Composite Scales for Technology Use Regularly at School (N = 25)

	Tertiary A			Tertiary B				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Talk or Email Friends	11	4.64	.67	14	4.21	1.25	1.01	.33
Get Information	11	3.82	1.25	14	3.79	1.31	.06	.95
Shopping	11	2.64	1.03	14	2.71	1.20	-.17	.87
Playing Games	10	3.90	1.10	14	2.43	1.34	2.85	.01*
Find Out About Current Event	10	4.30	.95	14	4.00	1.41	.58	.57
Listen to Music	10	3.90	1.10	14	3.79	1.42	.21	.83
Use Graphics, Designs	11	3.82	1.33	14	3.50	1.40	.58	.57
Find Out About Entertainment	11	3.73	1.35	14	2.71	1.27	1.93	.07
Learn About Health	11	3.82	1.25	14	2.86	1.35	1.82	.08
Look for Job	11	3.73	1.42	14	3.00	1.36	1.30	.21
Update Web Page	11	3.55	1.63	14	3.36	1.50	.30	.77
Online Communities	11	3.18	1.54	14	2.36	1.56	1.32	.20
Express My Opinion	11	2.36	1.43	14	2.29	1.54	1.29	.90
Find Out About Volunteer	11	2.27	1.01	14	2.50	1.34	-.47	.65
Contact Government	11	2.45	1.29	14	2.07	1.54	.66	.52
Online Banking	11	2.91	1.22	14	3.14	1.66	-.34	.74
Personal Research	11	3.91	1.22	14	3.21	1.31	1.36	.19

* $p < 0.05$.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for updating web pages. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for participating in online communities. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for expressing their opinions. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for finding out about volunteer programs. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for contacting government agencies. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for online banking. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of technology for personal research. The null hypothesis was retained.

Null Hypothesis 8: There is no significant difference between pre-service teachers' perceptions by teacher education programs in type of technology products used on a regular basis at their place of residence in a selected Union Conference of the Seventh-day Adventist education system.

Table 24 shows the results for the use of technology product in institutions where almost all (96%) pre-service teachers indicated that they used cell phone technology regularly in a typical week of work and little more than a tenth (12%) of the pre-service teachers use smart boards.

Table 24

Descriptive Statistics for Technology Products Used Regularly by Pre-service Teachers at Place of Residence (N = 25)

Items	Number and (Percentages) of Responses				*M*	*SD*
	1	2	3	4		
Desktop Computer	9 (36.0)	7 (28.0)	4 (16.0)	5 (20.0)	2.20	1.16
Laptop Computer	14 (56.0)	3 (12.0)	5 (20.0)	3 (12.0)	1.88	1.13
Cell Phone	22 (88.0)	2 (8.0)	1 (4.0)	0 (0.0)	1.16	.47
Hand-held Devices	3 (12.0)	0 (0.0)	5 (20.0)	17 (68.0)	3.44	1.00
Digital Camera	2 (8.0)	11 (44.0)	7 (28.0)	5 (20.0)	2.60	.91
Video Camera	2 (8.0)	5 (20.0)	9 (36.0)	9 (36.0)	3.00	.96
Scanner	2 (8.0)	2 (8.0)	13 (52.0)	8 (32.0)	3.08	.86
DVD or CD Burner	7 (28.0)	4 (16.0)	11 (44.0)	3 (12.0)	2.40	1.04
MP3 Player or IPOD	8 (33.3)	1 (4.2)	8 (33.3)	7 (29.2)	2.58	1.25
Video Game	3 (12.0)	1 (4.0)	8 (32.0)	13 (52.0)	3.24	1.01
Smart Board	1 (4.0)	1 (4.0)	3 (12.0)	20 (80.0)	3.68	.75

Note. 1 = Use Daily, 2 = Use Frequently, 3 = Seldom Use, 4 = Never Use.

Table 25 indicates the mean, standard deviation, independent *t*-test, and number of cases by pre-service institutions in a selected Union Conference of the Seventh-day Adventist education system. An independent sample *t* test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by institution type with pre-service teachers in the use of technology. The following results were obtained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of desktop computer technology on a regular basis at work. The null hypothesis was retained.

Table 25

Means and Standard Deviation of Total Scale and Composite Scales for Technology Used Regularly at Place of Residence (N = 25)

	Tertiary A			Tertiary B				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Desktop Computer	11	2.27	1.19	14	2.14	1.17	.27	.79
Laptop Computer	11	2.36	1.21	14	1.50	.94	2.01	.06
Cell Phone	11	1.09	.30	14	1.21	.58	-.64	.53
Hand-held Devices	11	3.27	1.27	14	3.64	.84	-.87	.39
Digital Camera	11	3.00	.89	14	2.29	.82	2.07	.05*
Video Camera	11	3.36	.92	14	2.79	1.05	1.44	.16
Scanner	11	3.18	.87	14	3.00	.88	.52	.61
DVD or CD Burner	11	2.55	1.12	14	2.29	.99	.61	.55
MP3 Player or IPod	10	3.10	1.29	14	2.29	1.27	1.54	.14
Video Games	11	3.36	1.03	14	3.21	1.12	.34	.74
Smart Board	11	3.82	.75	14	3.64	.84	.54	.59

* $p < 0.05$.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of laptop computer technology on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of cell phone technology on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of handheld device technology on a regular basis at work. The null hypothesis was retained.

There is a significant difference in the perceptions of pre-service teachers by institution, where Tertiary A pre-service teachers (M = 3.00, SD = .894) use digital camera technology more than Tertiary B pre-service teachers (M = 2.29, SD = .825). The null hypothesis was rejected.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of video camera technology on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of DVD or CD burner technology on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of video games technology on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of smart board technology on a regular basis at work. The null hypothesis was retained.

Null Hypothesis 9: There is no significant difference between pre-service teachers' perceptions by teacher education programs in the regular use of technology products in preparation for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Table 26 shows the results for adequate preparation to handle academic issues with the use of technology by pre-service teachers where a little more than four-fifths (90%) of respondents felt they were prepared to handle research and presentation.

Table 26

Descriptive Statistics for Technology Products Used Resulting From Adequate Preparation by Pre-service Teachers ($N = 25$)

Items	Number and (Percentages) of Responses 1	2	3	4	5	*M*	*SD*
Keep Grades and Records	1 (04.3)	1 (04.3)	3 (13.0)	9 (39.1)	9 (39.1)	4.04	1.07
Word Processing	1 (04.5)	0 (00.0)	2 (09.1)	6 (27.3)	13 (59.1)	4.36	1.00
Research and Presentations	0 (00.0)	0 (00.0)	2 (09.1)	9 (40.9)	11 (50.0)	4.41	.67
Project-based Learning	0 (00.0)	3 (13.6)	5 (22.7)	4 (18.2)	10 (45.5)	3.95	1.13
Online Professional Dev.	1 0(4.8)	5 (23.8)	9 (42.9)	0 (00.0)	6 (28.6)	3.24	1.26
Research Info. For Students	1 (04.5)	2 (09.1)	5 (22.7)	6 (27.3)	8 (36.4)	3.82	1.18
Conduct Student Assess	1 (04.5)	3 (13.6)	4 (18.2)	7 (31.8)	7 (31.8)	3.73	1.20
Use An Online Cont. Prov.	5 (21.7)	8 (34.8)	5 (21.7)	2 (08.7)	3 (13.0)	2.57	1.31
Use A School Cont. Prov.	4 (17.4)	9 (39.1)	5 (21.7)	1 (04.3)	4 (17.4)	2.65	1.34
Research Special Needs	1 (04.5)	2 (09.1)	5 (22.7)	9 (40.9)	5 (22.7)	3.68	1.09
Research Social and Fam.	2 (08.7)	6 (26.1)	4 (17.4)	7 (30.4)	4 (17.4)	3.22	1.28
Communicate With Pro.	0 (00.0)	4 (18.2)	7 (31.8)	3 (13.6)	8 (36.4)	3.68	1.17
Update A Class Website	2 (08.7)	5 (21.7)	7 (30.4)	5 (21.7)	4 (17.4)	3.17	1.23
Access Education Web	1 (04.3)	4 (17.4)	7 (30.4)	7 (30.4)	4 (17.4)	3.39	1.12

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Table 27 shows the mean, standard deviation, independent *t* test, and number of cases by institution for pre-service teachers in a selected Union Conference of the Seventh-day Adventist education system. An independent sample *t* test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by institutions in the preparation to use technology for the classroom. The following results were obtained.

There is no significant difference by institution in the perception of pre-service teachers to having been adequately prepared to use technology regularly to do grades and attendance records. The null hypothesis was retained.

There is no significant difference by institution in the perception of pre-service teachers to have been adequately prepared to use technology regularly to do word processing. The null hypothesis was retained.

There is a significant difference by institution in the perceptions of pre-service teachers to have been adequately prepared to use technology regularly where Tertiary B pre-service teachers (M = 4.67, SD = .49) use more technology for research and presentations than Tertiary A pre-service teachers (M = 4.10, SD = .74). The null hypothesis was therefore rejected.

There is no significant difference by institution in the perception of pre-service teachers to have been adequately prepared to use technology regularly to do project-based learning. The null hypothesis was retained.

There is no significant difference by institution in the perception of pre-service teachers to have been adequately prepared to use technology regularly to do online professional development. The null hypothesis was retained.

There is a significant difference by institution in the perceptions of pre-service teachers to have been adequately prepared to use technology regularly where Tertiary B pre-service teachers (M =4.33, SD = .88) use more technology for research information than Tertiary A pre-service teachers (M = 3.20, SD = 1.23). The null hypothesis was therefore rejected.

There is a significant difference by institution in the perceptions of pre-service teachers to have been adequately prepared to use technology regularly where Tertiary B pre-service teachers (M =4.38, SD = .65) use more technology to conduct student assessment than do Tertiary A pre-service teachers (M = 2.78, SD = 1.20). The null

hypothesis was therefore rejected.

Table 27

Means and Standard Deviation of Total Scale and Composite Scales for Technology Use Regularly at Work ($N = 23$)

	Tertiary A			Tertiary B				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Grades and Attendance Records	10	3.60	1.35	13	4.38	.65	-.18	.08
Word Processing	9	3.89	1.36	13	4.69	.48	-.20	.06
Research and Presentations	10	4.10	.74	12	4.67	.49	-2.15	.04*
Project-based Learning	10	3.70	1.25	12	4.17	1.03	-.96	.35
Online Professional Development	9	2.89	1.36	12	3.50	1.17	-1.11	.28
Research Information	10	3.20	1.23	12	4.33	.89	-2.51	.02*
Conduct Student Assessments	9	2.78	1.20	13	4.38	.65	-4.06	.00*
Use an Online Content	10	2.90	1.37	13	2.62	1.20	-.20	.84
Use of School Content	10	2.90	1.37	13	2.46	1.33	.77	.45
Research Special needs	9	3.00	1.23	13	4.15	.69	2.83	.01*
Research Social and Family Serv.	10	3.00	1.25	13	3.38	1.3	-.71	.49
Communicate with Prof.	9	3.33	1.12	13	3.46	1.19	-1.17	.26
Update a Class or Web	10	2.80	1.32	13	3.46	1.13	-1.30	.21
Access Educational Website	10	2.80	1.14	13	3.85	.90	-2.47	.02*

* $p < 0.05$.

There is no significant difference by institution in the perception of pre-service teachers to have been adequately prepared to use technology regularly to use as online content. The null hypothesis was retained.

There is no significant difference by institution in the perception of pre-service teachers to have been adequately prepared to use technology regularly to use as school content. The null hypothesis was retained.

There is a significant difference by institution in the perceptions of pre-service teachers to have been adequately prepared to use technology regularly where Tertiary B pre-service teachers (M =3.15, SD = .69) use more technology to research as special needs than do Tertiary A pre-service teachers (M = 3.00, SD = 1.22). The null hypothesis was rejected.

There is no significant difference by institution in the perception of pre-service teachers to have been adequately prepared to use technology regularly to research social and family services, the null hypothesis was retained.

There is no significant difference by institution in the perception of pre-service teachers to have been adequately prepared to use technology regularly to communicate with professor. The null hypothesis was retained.

There is no significant difference by institution in the perception of pre-service teachers to have been adequately prepared to use technology regularly to update a class or web page. The null hypothesis was retained.

There is a significant difference by institution in the perceptions of pre-service teachers to have been adequately prepared to use technology regularly where Tertiary B pre-service teachers (M =3.85, SD = .89) use more technology to access educational websites than do Tertiary A pre-service teachers (M = 2.80, SD = 1.13). The null hypothesis was retained.

Null Hypothesis 10: There is no significant difference between pre-service teachers' perceptions by teacher education programs in the uses of Internet technology products use on a regular basis as a tool for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Table 28 shows the results for the use of Internet technology products where almost all (95%) pre-service teachers indicated they use Internet technology as a search engine, less than half (44%) use it to access portal sites, and less than one-fifth of the pre-service teachers agreed or strongly agreed that they use Internet technology for listservs (13%), chat rooms (12%), and web logs (12%).

Table 28

Descriptive Statistics for Internet Technology Products Used Regularly by Pre-service Teachers ($N = 25$)

	Number and (Percentages) of Responses					
Items	1	2	3	4	*M*	*SD*
Email	13 (52.0)	8 (32.0)	1 (4.0)	3 (12.0)	1.76	1.01
Listservs	2 (9.1)	1 (4.5)	2 (9.1)	17 (77.3)	3.55	.96
Specific Internet Web	11 (44.0)	0 (40.0)	1 (4.0)	3 (12.0)	1.84	.99
Search Engines	14 (58.3)	9 (37.5)	0 (0.0)	1 (4.2)	1.50	.72
New Website	6 (25.0)	8 (33.3)	8 (33.3)	2 (8.3)	2.25	.94
Instant Messenger	6 (24.0)	4 (16.0)	8 (32.0)	7 (28.0)	2.64	1.15
Discussion Boards	2 (8.0)	2 (8.0)	8 (32.0)	13 (52.0)	3.28	.94
Chat Rooms	4 (16.0)	0 (0.0)	5 (20.0)	16 (64.0)	3.32	1.11
Web Logs (Blogs)	3 (12.0)	0 (0.0)	10 (40.0)	12 (48.0)	3.24	.97
Portal Sites	5 (20.0)	6 (24.0)	6 (24.0)	8 (32.0)	2.68	1.14

Note. 1 = Use Daily, 2 = Use Frequently, 3 = Seldom Use, 4 = Never Use.

Table 29 indicates the mean, standard deviation, independent *t*-test, and number of cases by school types for students in a selected Union Conference of the Seventh-day Adventist education system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by

institution type in the use of Internet technology in a typical week of work.

There is a significant difference in the perceptions of pre-service teachers by institution, where Tertiary A pre-service teachers (M =2.36, SD = 1.36) use more Internet technology for email than Tertiary B pre-service teachers (M = 1.36, SD = 63). The null hypothesis was rejected.

Table 29

Means and Standard Deviation of Total Scales and Composite Scales for Technology Use Regularly (N = 25)

	Tertiary A			Tertiary B				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Email	11	2.36	1.36	14	1.36	.63	2.46	.02*
Listservs	9	3.67	1.00	13	3.46	.97	.48	.63
Specific Internet Websites	11	2.09	1.14	14	1.64	.84	1.13	.27
Search Engines	11	2.09	1.14	13	1.46	.52	.29	.78
New Website	10	2.30	1.06	14	2.21	.90	.22	.83
Instant Messenger	11	2.55	1.29	14	2.71	1.07	-.36	.72
Discussion Boards	11	3.36	.92	14	3.21	.98	.39	.70
Chat rooms	11	3.27	1.19	14	3.36	1.08	-.19	.85
Web Logs (Blogs)	11	3.36	.92	14	3.14	1.03	.56	.58
Portal Sites	11	2.55	1.21	14	2.93	1.33	-.74	.47

*$p < 0.05$.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of Internet technology for listservs on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of Internet technology for specific Internet websites on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of Internet technology as a search engine on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of Internet technology for accessing new websites on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of Internet technology for instant messenger on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of Internet technology for discussion boards on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of Internet technology for chat rooms on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of Internet technology for web logs (blogs) on a regular basis at work. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of Internet technology for surfing portal sites on a

regular basis at work. The null hypothesis was retained.

Null Hypothesis 11: There is no significant difference between pre-service teacher perceptions by teacher education programs where the preparation program has prepared pre-service teachers to use technology tools to enhance teaching and instruction in the classroom in a selected Union Conference of the Seventh-day Adventist education system.

Table 30 shows the results for the use of technology on a regular basis in the institution by pre-service teachers where a majority (84%) indicated that they used technology as a productivity tool on a regular basis and a little more than a half (52%) used technology as an instructional tool.

Table 30

Descriptive Statistics for Use of Internet Technology Tools Resulting From Pre-service Teachers' Preparation (N = 25)

	Number and (Percentages) of Responses						
Items	1	2	3	4	5	*M*	*SD*
Productivity Tools	2 (08.0)	1 (04.0)	1 (04.0)	12 (48.0)	9 (36.0)	4.00	1.16
Instructional Tools	2 (08.0)	2 (08.0)	8 (32.0)	9 (36.0)	4 (16.0)	3.44	1.12
Instructional Tools (Mangt)	3 (12.0)	3 (12.0)	8 (32.0)	6 (24.0)	5 (20.0)	3.28	1.28
Integ, Tech. Into Curriculum	3 (12.0)	1 (04.0)	4 (16.0)	11 (44.0)	6 (24.0)	3.64	1.25
Integ, Tech. Into Curr. Spec	3 (12.0)	1 (04.0)	3 (12.0)	13 (52.0)	5 (20.0)	3.64	1.22

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Table 31 shows the mean, standard deviation, independent *t*-test, and number of cases by institution types for pre-service teachers in a selected Union Conference of the

Seventh-day Adventist education system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significance difference ($p = 0.05$) by institution type in the use of productivity and instructional technology. The following results were obtained.

Table 31

Means and Standard Deviation of Total Scale and Composite Scales for Technology Use Regularly (N=25)

	Tertiary A			Tertiary B				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Productivity Tools	11	3.36	1.43	14	4.50	.52	-2.76	.01*
Instructional Tools (Information Systems)	11	3.00	1.34	14	3.79	.80	-1.82	.08
Instructional Tools Management	11	2.82	1.40	14	3.64	1.08	-1.66	.11
Integrating Technology Into Curriculum. General	11	2.82	1.40	14	4.29	.61	-3.53	.00*
Integrating Technology Into Curriculum. Specific	11	2.91	1.45	14	4.21	.58	-3.09	.00*

* $p < 0.05$.

There is a significant difference in the perceptions of pre-service teachers by institution where Tertiary B pre-service teachers ($M = 4.50$, $SD = .52$) use more productivity technology tools than Tertiary A pre-service teachers ($M = 3.36$, $SD = 1.43$) on a regular basis. The null hypothesis was rejected.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of instructional technology for information systems

on a regular basis. The null hypothesis was retained.

There is no significant difference in the perceptions of pre-service teachers in Tertiary A and Tertiary B in their use of instructional technology tools management on a regular basis. The null hypothesis was retained.

There is a significant difference in the perceptions of pre-service teachers by institution where Tertiary B pre-service teachers (M = 4.29, SD = .61) use more tools for integrating technology into the curriculum in a general way on a regular basis than do Tertiary A pre-service teachers (M = 2.82, SD = 1.40). The null hypothesis was therefore rejected.

There is a significant difference in the perceptions of pre-service teachers by institution where Tertiary B pre-service teachers (M = 4.21, SD = .58) use more tools for integrating technology into the curriculum for specific areas on a regular basis than do Tertiary A pre-service teachers (M = 2.91, SD = 1.45). The null hypothesis was therefore rejected.

Null Hypothesis 12: There is no significant difference between pre-service teacher perceptions by teacher education programs in the regular use of technology for teaching and instruction in subject areas in a selected Union Conference of the Seventh-day Adventist education system.

Table 32 shows the results for adequate preparation to handle security issues in the use of technology by pre-service teachers where a little more than half (52%) were prepared to handle plagiarism and a little more than a quarter (28%) indicated they can handle hacking and viruses.

Table 32

Descriptive Statistics for Pre-service Teacher Preparations for Handling of Technology Security Issues Coming Out of the Users at School (N = 25)

Items	Number and (Percentages) of Responses 1	2	3	4	5	*M*	*SD*
Online Bulling	7 (28.0)	8 (32.0)	5 (20.0)	1 (4.0)	4 (16.0)	2.48	1.39
Privacy Invasion	6 (24.0)	7 (28.0)	4 (16.0)	4 (16.0)	4 (16.0)	2.72	1.43
Advertising and Spam	5 (20.0)	9 (36.0)	2 (8.0)	4 (16.0)	5 (20.0)	2.80	1.47
Pornography	5 (20.0)	6 (24.0)	4 (16.0)	4 (16.0)	6(24.0)	3.00	1.50
Hacking and Viruses	7 (28.0)	7 (28.0)	4 (16.0)	2 (8.0)	5(20.0)	2.64	1.50
Digital Divide	6 (25.0)	7 (29.2)	5 (20.8)	2 (8.3)	4(16.7)	2.63	1.41
Plagiarism	4 (16.0)	2 (8.0)	6 (24.0)	8 (32.0)	5 (20.0)	3.32	1.35
Piracy and Illegal Down Load	4 (16.0)	7 (28.0)	8 (32.0)	2 (8.0)	4 (16.0)	2.80	1.29

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Table 33 shows the mean, standard deviation, independent *t*-test, and number of cases by institution for pre-service teachers in a selected Union Conference of the Seventh-day Adventist education system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significant difference (p = 0.05) by institution in the preparation to use technology as a security tool. The following results were obtained.

There is no significant difference in the preparation of the pre-service teachers in Tertiary A and Tertiary B to use technology on a regular basis for security and control of online bullying. The null hypothesis was retained.

There is no significant difference in the preparation of the pre-service teachers in Tertiary A and Tertiary B to use technology on a regular basis to control for privacy

invasion. The null hypothesis was retained.

There is no significant difference in the preparation of the pre-service teachers in Tertiary A and Tertiary B to use technology on a regular basis to control access to pornography. The null hypothesis was retained.

Table 33

Means and Standard Deviation of Total Scale and Composite Scales for Technology Use Regularly (N=25)

	Tertiary A			Tertiary B				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Online Bullying	11	2.36	1.63	14	2.57	1.22	-.37	.72
Privacy Invasion	11	2.55	1.70	14	2.86	1.23	-.53	.60
Advertising and Spam	11	2.64	1.63	14	2.93	1.39	-.49	.63
Pornography	11	2.73	1.62	14	3.21	1.42	-.80	.43
Hacking and Viruses	11	2.45	1.64	14	2.79	1.42	-.54	.59
Digital Divide	10	2.40	1.71	14	2.79	1.19	-.65	.52
Plagiarism	11	2.82	1.60	14	3.71	.99	-1.72	.10
Piracy and Illegal Downloads	11	2.64	1.57	14	1.07	.29	-.55	.59

* $p < 0.05$.

There is no significant difference in the preparation of the pre-service teachers in Tertiary A and Tertiary B to use technology on a regular basis to protect against hacking and viruses. The null hypothesis was retained.

There is no significant difference in the preparation of the pre-service teachers in Tertiary A and Tertiary B to use technology on a regular basis to address digital divides issues. The null hypothesis was retained.

There is no significant difference in the preparation of the pre-service teachers in Tertiary A and Tertiary B to use technology on a regular basis to detect the use of plagiarism by students. The null hypothesis was retained.

Null Hypothesis 13: There is no significant difference between pre-service teacher perceptions by teacher education programs, in the preparation to use technology for handling software security issues during teaching and instructions in a selected Union Conference of the Seventh-day Adventist education system.

Table 34 shows the results for adequate preparation to handle software issues with the use of technology by pre-service teachers, where a little more than four-fifths

Table 34

Descriptive Statistics for Technology Products Used Regularly by Pre-service Teachers at School (*N* = 25)

	Number and (Percentages) of Responses						
Items	1	2	3	4	5	*M*	*SD*
Email or Online Chats	1 (4.3)	10 (43.5)	3 (13.0)	3 (13.0)	6 (26.1)	3.13	1.36
Online Textbooks	1 (4.3)	10 (43.5)	3 (13.0)	4 (17.4)	5 (21.7)	3.09	1.31
Online Classes	3 (13.0)	9 (39.1)	4 (17.4)	1 (4.3)	6 (26.1)	2.91	1.44
Subject Specified	0 (0.0)	6 (27.3)	1 (4.5)	8 (36.4)	7 (31.8)	3.73	1.20
General Search Engine	0 (0.0)	3 (13.0)	1 (4.3)	9 (39.1)	12 (43.5)	4.13	1.01
Database or Online Dir.	0 (0.0)	7 (30.4)	4 (17.4)	5 (21.7)	7 (30.4)	3.52	1.24
Online Simulation	1 (4.3)	8 (34.8)	7 (30.4)	2 (8.7)	5 (21.7)	3.09	1.24
Subject Specific Software	0 (0.0)	8 (36.4)	3 (13.6)	6 (27.3)	5 (22.7)	3.36	1.22
Streaming Videos	3 (13.0)	6 (26.1)	2 (8.7)	5 (21.7)	7 (30.4)	3.30	1.49

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

(82%) felt prepared to handle general search engines regularly; about half (52%) agreedor strongly agreed that they were prepared to handle database or online directory and streaming videos, while less than a third (30%) disagreed they were prepared to handle online classes and online simulations.

Table 35 shows the means and standard deviations, independent *t*-test, and number of cases by school types for students in a selected Union Conference of the Seventh-day Adventist education system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by institution in the use of technology products at school. The following results were obtained.

There is no significant difference in the perception of pre-service teachers by institution to have been adequately prepared to use software technology regularly to email or online chats. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution to have been adequately prepared to use software technology regularly to search for online textbooks. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution to have been adequately prepared to use software technology regularly to participate in online classes. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution to have been adequately prepared to use software technology regularly to do subject specified web sites. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by

institution to have been adequately prepared to use software technology regularly to use general search engines. The null hypothesis was retained.

Table 35

Means and Standard Deviation of Total Scale and Composite Scales for Technology Use Regularly (N=25)

	Tertiary A			Tertiary B				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Email or Online Chats	10	3.00	1.25	13	3.23	1.48	-.40	.70
Online Textbooks	10	3.00	1.41	13	3.15	1.28	-.27	.79
Online Classes	10	3.00	1.49	13	2.85	1.46	.25	.81
Subject Specified Web Sites	9	3.22	1.30	13	4.08	1.04	-1.71	.10
General Search Engine	10	3.90	1.20	13	4.31	.85	-.95	.35
Database or Online Directory	10	3.30	1.34	13	3.69	1.18	-.75	.46
Online Simulation	10	2.80	1.23	13	3.31	1.25	-.97	.34
Subject Specific Software	10	3.10	1.29	13	3.58	1.17	-.93	.37
Streaming Videos	10	3.00	1.63	13	3.54	1.39	-.85	.40

* $p < 0.05$.

There is no significant difference in the perception of pre-service teachers by institution to have been adequately prepared to use software technology regularly to use databases or online directories. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution to have been adequately prepared to use software technology regularly to do online simulations. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution to have been adequately prepared to use software technology regularly to

activate and use subject specific software. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution to have been adequately prepared to use software technology regularly to use streaming videos. The null hypothesis was retained.

Null Hypothesis 14: There is no significant difference between pre-service teachers' perceptions by teacher education programs in technology resources and software resources available for use by pre-service teachers on a regular basis for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Table 36 shows the results for availability of technology to perform academic task by pre-service teachers where little more than four-fifths (87%) indicated adequate availability of working computers; however, less than a half (43%) receive support from administration.

Table 37 shows the means and standard deviations, independent *t*-test, and number of cases by school types for students in a selected Union Conference of the Seventh-day Adventist education system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by institution type in the use of technology products at school. The following results were obtained.

There is no significant difference in the perception of pre-service teachers by institution that there are enough computers to use on a regular basis. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by

institution that there are working computers to use on a regular basis. The null hypothesis was retained.

Table 36

Descriptive Statistics for Technology Resources Used Regularly at the Institution by Pre-service Teachers at School ($N = 25$)

	Number and (Percentages) of Responses						
Items	1	2	3	4	5	*M*	*SD*
Enough Computers	0 (0.0)	4 (17.4)	1 (4.3)	10 (43.5)	8 (34.8)	3.96	1.07
Working Computers	0 (0.0)	1 (13.0)	0 (0.0)	12 (52.2)	8 (34.8)	4.09	.95
Fast and Reliable	1 (4.3)	2 (8.7)	3 (13.0)	9 (39.1)	8 (34.8)	3.91	1.13
Computers in Secured Loc.	0 (0.0)	2 (8.7)	2 (8.7)	12 (52.2)	7 (30.4)	4.04	.88
Adequate Software	0 (0.0)	2 (8.8)	4 (17.4)	10 (43.5)	7 (30.4)	3.96	.93
Software or Website Support	1 (4.3)	3 (13.0)	4 (17.4)	7 (30.4)	8 (34.8)	3.78	1.20
Enough Time in School Day	2 (8.7)	2 (8.7)	1 (4.3)	12 (52.2)	6 (26.1)	3.78	1.20
Enough Time for Planning	2 (8.7)	3 (13.0)	2 (8.7)	10 (43.5)	6 (26.1)	3.65	1.27
Reliable Technology Sup.	1 (4.3)	4 (17.4)	4 (17.4)	8 (34.8)	6 (26.1)	3.61	1.20
Support from Administration	0 (0.0)	3 (13.0)	10 (43.5)	4 (17.4)	6 (26.1)	3.57	1.34
Adequate Knowledge	0 (0.0)	4 (17.4)	3 (13.0)	11 (47.8)	5 (21.7)	3.74	1.01

$p < .05$.

There is no significant difference in the perception of pre-service teachers by institution that there is fast and reliable working Internet to use on a regular basis. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution that the computers are in a convenient location to use on a regular basis. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by

institution that there is adequate software to use on a regular basis. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution that there is adequate software or website support for state and district standards on a regular basis. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution that there is enough time in the school day on a regular basis. The null hypothesis was retained.

Table 37

Means and Standard Deviation of Total Scale and Composite Scales for Technology Use Regularly ($N = 23$)

	Tertiary A			Tertiary B				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Enough Computers	10	4.10	.88	13	3.85	1.21	.56	.58
Working Computers	10	4.10	.88	13	4.08	1.04	.06	.96
Fast or Reliable Working Int. Acce.	10	3.60	1.08	13	4.15	1.14	-1.18	.25
Computers are in a Convenient Loc.	10	4.10	.88	13	4.00	.91	.27	.79
Adequate Software	10	4.00	.82	13	3.92	1.04	.19	.85
Software or Websites Support For State and District Standards	10	3.90	1.20	13	3.69	1.25	.40	.69
Enough Time in School day	10	3.70	1.25	13	3.85	1.21	-.28	.78
Enough Time for Planning	10	3.30	1.34	13	3.92	1.19	-1.18	.25
Reliable Technology Support	10	3.30	1.34	13	3.69	1.32	-.38	.71
Support from Administrators	10	3.20	1.03	13	3.85	.99	-1.53	.14
Adequate Knowledge of Using	10	3.80	.92	13	3.69	1.11	.25	.81

* $p < 0.05$.

There is no significant difference in the perception of pre-service teachers by institution that there is available technology that includes enough time in the day for planning on a regular basis. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution that there is available technology that includes reliable technology support on a regular basis. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution that there is available technology that includes support from administration on a regular basis. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution that there is available technology that includes adequate knowledge of using technology on a regular basis. The null hypothesis was retained.

Null Hypothesis 15: There is no significant difference between pre-service teacher perceptions by teacher education programs in the regular use of hardware, software, and technology programs available for pre-service teachers on a regular basis at the institution for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system.

Table 38 shows the available technology at the institution for use by pre-service teachers where all of them indicated they agreed or strongly agreed that fast, wireless Internet access, new updated software, and adequate technology maintenance were available at the respondent's institution.

Table 39 shows the means and standard deviations, independent *t* test, and number of cases by school types for students in a selected Union Conference of the

Seventh-day Adventist education system. An independent sample *t* test was conducted (equal variance was not assumed) to determine if there was any significant difference ($p = 0.05$) by institution type in the use of technology products at school. The following results were obtained.

Table 38

Descriptive Statistics for Important Available Technology for Pre-teachers to Have at a New School for Use Regularly (N = 23)

	Number and (Percentages) of Responses						
Items	1	2	3	4	5	*M*	*SD*
Fast, Wireless Internet Access.	0 (00.0)	0 (00.0)	0 (00.0)	3 (13.0)	20 (87.0)	4.87	.34
New Update Software	0 (00.0)	0 (00.0)	0 (00.0)	5 (21.7)	18 (78.3)	4.78	.42
A New Computer for Teaching .	0 (00.0)	0 (00.0)	2 (08.7)	9 (39.1)	12 (52.2)	4.43	.66
A Hand-held Device for Teaching	0 (00.0)	6 (26.1)	8 (34.8)	6 (26.1)	3 (13.0)	3.26	1.01
Digital Cameras	0 (00.0)	0 (00.0)	1 (04.3)	13 (56.5)	9 (39.1)	4.35	.57
Video Equipment for Teacher	0 (00.0)	0 (00.0)	2 (08.7)	9 (39.1)	12 (52.2)	4.43	.66
A Teachers Computer Lab	0 (00.0)	3 (13.0)	4 (17.4)	9 (39.1)	7 (30.4)	3.87	1.01
Teachers Comp. Lab, Evenings	0 (00.0)	1 (04.5)	2 (09.1)	13 (59.1)	6 (27.3)	4.09	.75
Schedule Teacher Development.	0 (00.0)	0 (00.0)	2 (08.7)	9 (39.1)	12 (52.2)	4.43	.66
Access to the School's Network	1 (04.3)	0 (00.0)	2 (08.7)	7 (30.4)	13 (56.5)	4.35	.98
Adequate Technology	0 (00.0)	0 (00.0)	0 (00.0)	11 (50.0)	11 (50.0)	4.50	.51
New Computers Through the School	0 (00.0)	5 (21.7)	2 (08.7)	9 (39.1)	7 (30.4)	3.78	1.13
A Film Studio	0 (00.0)	1 (04.3)	7 (30.4)	5 (21.7)	10 (43.5)	4.04	.98
Laptop for All Students	3 (13.0)	7 (30.4)	3 (13.0)	5 (21.7)	5 (21.7)	3.09	1.41

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

There is a significant difference in the perception of pre-service teachers by institution of having fast wireless Internet technology available at the institution for use.

The pre-service teachers at Tertiary B (M = 500, SD = .000) indicated that they have more Internet technology available for use than those in Tertiary A (M = 470, SD = .48). The null hypothesis was rejected.

Table 39

Means and Standard Deviation of Total Scale and Composite Scales for Important Available Technology for Pre-teachers to Have at a New School for Use Regularly (N = 23)

	Tertiary A			Tertiary B				
Items	*N*	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Fast, Wireless Internet	10	4.70	.48	13	5.00	.00	-2.26	.04*
New Up-to-date Software	10	4.70	.48	13	4.85	.38	-.82	.42
A New Computer for Every Teach	10	4.60	.52	13	4.31	.75	1.05	.31
A Hand-held Device	10	3.40	.97	13	3.15	1.07	.57	.57
Digital Cameras	10	4.30	.68	13	4.38	.51	-.34	.73
Video Equipment	10	4.50	.71	13	4.38	.65	.41	.69
A Teacher's Computer Lab	10	4.00	1.05	13	3.77	1.01	.53	.60
A teacher's Computer Lab-Even	9	4.22	.67	13	4.00	.82	.67	.51
Schedules Teacher Development	10	4.40	.67	13	4.46	.66	-.22	.83
Access to the School Network	10	4.00	1.25	13	4.62	.65	-1.54	.14
Adequate Technology Maintenance	9	4.44	.53	13	4.54	.52	-.42	.68
New Computers	10	3.60	1.27	13	3.92	1.04	-.67	.51
A Film Studio	10	4.30	.82	13	3.85	1.07	1.11	.28
Laptop for Every Student	10	2.70	1.50	13	3.38	1.33	-1.16	.26

* $p < 0.05$.

There is no significant difference in the perception of pre-service teachers by institution of having new up-to-date software available at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having a new computer for every teacher available at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having a hand-held device available at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having digital cameras available at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having video equipment available at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having a teachers' computer lab open on weekends at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having a teachers' computer lab open on evenings at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having scheduled teacher development at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having access to the school network available at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having adequate technology maintenance available at the institution. The

null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having new computers for every teacher available at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having a film studio for teachers available at the institution for use. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by institution of having a laptop available for every student in their classroom at the institution for use. The null hypothesis was retained.

Null Hypothesis 16: There is no significant difference by gender in the overall use of technology products by pre-service teachers in the classroom and out of the classroom for teaching and instruction in a selected Union Conference of the Seventh-day Adventist education system of a multistate region.

Table 40 shows the means, standard deviations, independent *t*-test, and number of cases by gender types for pre-service teachers in a selected Union Conference of the Seventh-day Adventist education system. An independent sample *t*-test was conducted (equal variance was not assumed) to determine if there was any significant difference (p =0.05) by institution type in the use of technology products at school. The following results were obtained:

There is no significant difference in the perception of pre-service teachers by gender of their overall use of technology on a regular basis. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by gender of their overall use of technology in a typical week of work. The null hypothesis was retained.

There is no significant difference in the perception of pre-service teachers by gender of their overall use of Internet technology for work. The null hypothesis was retained.

Table 40

Means and Standard Deviation of Total Composite Scales for Technology Use Regularly by Gender (N = 24)

	Male			Female				
Items	N	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*
Overall use of technology:								
On a regular basis	8	59.75	14.57	16	52.25	17.68	1.03	.31
Typical week of work	7	29.43	8.34	17	29.88	5.17	-.16	.87
Internet for work	7	27.00	8.16	14	26.21	5.82	.26	.80

* $p < 0.05$.

Research Question 3: What selected variables contribute to the perceptions of advanced technological abilities of students and pre-service teachers in the selected Union Conference (multistate region) of the Seventh-day Adventist school system?

Null Hypothesis 17: There are no linear relationships between the overall advanced technological ability score and the independent variables of students'

perceptions of technology in a selected Union Conference of the Seventh-day Adventist education system.

Table 41 shows the correlations between overall advanced technological abilities scores and the independent variables, where experience in Internet use showed a very high correlation (r = .84), and products use in subject areas showed a moderate correlation (r = .58).

Table 41

Means, Standard Deviations, and Correlations Between Overall Advanced Technological Ability Scores, and Technology Variables of the Perception of Students (N = 164)

Variables	1	2	3	4
Overall Tech-savvy	1.00			
Products Used Regularly at School	.83**	1.00		
Products Use in All Subject Areas	.58**	.35**	1.00	
Experiences in Internet Use	.84**	.45**	.379*	1.00
Means	63.719	21.58	9.634	32.51
Standard Deviations	14.004	7.40	2.791	7.40

*** Significant at 0.01.* ** Significant at 0.05.*

Table 42 shows the results of regression analysis for the overall advanced technological abilities scores and the independent advanced technological ability variables. These variables accounted for 97% of the variance in the advanced technological abilities scores. This is significant at the 0.05 level. The best predictor is "products used regularly at school" ($\beta = 0.36$, $p < 0.000$). Thus, the null hypothesis

was rejected.

Table 42

Linear Regression Results for Students Perception of Technology Used at School and at Place of Residence and Their Advanced Technological Abilities (N = 164)

	p	*B*	*SE*	*β*	*t*
Constant	18.06	2.43		7.42	.00
Products Use Regularly at School	1.23	.08	.36	14.77	.00
Experience Internet Use	1.16	.08	.32	14.92	.00
Use in All Subject Areas	1.02	.73	.32	14.03	.00

Note. $r^2 = .96$, $F(4,135) = 725.218$, $p = 0.000$.

Null Hypothesis 18: There are no linear relationships between the overall advanced technological score and the independent variables of pre-service teachers' perceptions of technology in a selected Union Conference of the Seventh-day Adventist education system.

Table 43 shows the means, standard deviations, and correlations between the overall advanced technological abilities of pre-service teachers and the independent variables, where "well prepared to use technology effectively" and "technology prepared to help teach" showed high correlation ($r = .86$).

Table 44 shows the results of regression analysis for the overall advanced

technological abilities scores and the independent variables.

Table 43

Means, Standard Deviations, and Correlations Between Overall Advanced Technological Abilities of Teachers and the Independent Variables (N = 25)

Variables	1	2	3	4	5	6	7	8
Overall Tech Savvy	1.00							
Regular Tech Usage	.66**	1.00						
Product Use Weekly at Work	-.64*	-.51*	1.00					
Internet Tools at Work	-.62*	-.58**	.80**	1.00				
Well Prepared to Use	.75**	.21	-.42	-.50	1.00			
Tech Prepared to Use	.62*	.20	-.71**	-.64**	.54**	1.00		
Tech Prepared for Effective	.86**	.33	-.68**	-.65**	.75**	.61**	1.00	
Tech to Help Me Teach	.86**	.31	-.66**	-.53*	.75*	.59*	.91**	1.00
Means	235.69	53.94	29.06	26.00	19.37	24.25	52.31	30.70
Standard Deviations	32.37	18.93	7.08	7.25	5.54	9.82	11.61	10.15

* Significant at 0.05. **Significant at 0.01.

Table 44

Linear Regression Results for Pre-service Teachers' Overall Tech-Savvy Scores With the Independent Variables of Technology Experience. (N = 25)

	B	*SE*	*β*	*t*	*p*
Constant	113.23	9.28	12.20	.00	
Tech to Help Me Teach	1.68	.34	.53	5.00	.00
Regular Technology Use	.75	.12	.44	6.11	.00
Well Prepared to Use Technology	1.58	.60	.27	2.63	.02

Note. $r^2 = .945$; $F\ (3, 12) = 68.606$; $p < 0.000$.

The variables account for 94% of the variance in the overall advanced technological abilities of the pre-service teacher scores. This was significant at the 0.05 level. The best predictor is Prepared to Help Me Teach ($\beta = .53$, $p < 0.000$). Thus, the null hypothesis was rejected.

Summary of Major Findings

Research question 1 addressed perceptions of high-school students of technological abilities in the selected Unions' education system.

1. Almost all (98%) students in this study indicated that having access to technology was critical to their education.

2. Half of the students actively used technology at school to help with their school work (50.8%). However less than half (46%) of the students seemed to be using the computer lab at school for school activities, whereas about one third use computers in the classroom to help with their school work.

3. When students have free time, the number one use of technology was in talking to friends and family members (50.8%).

4. Between day and boarding students, the boarding students seem to be more tech-savvy ($M = 71.92$, $SD = 14.19$) than the day students ($M = 67.62$, $SD = 13.37$) in subject areas.

Students' Use of Technology

6. Students are active users of desktop computers (56.5%) and this constitutes the most regularly used technology product at school. However, on a regular basis, 79%

of the students us the cell phone as the most used technology product at their place of residence.

7. Students were using their advanced technology abilities in the many subject areas at school; the top area where technology was used at school was Social Studies/History (64.3%). However, almost all students (94%) used their technology skills to write reports using resources from the Internet.

8. Students stated that the greatest obstacle they faced in using technology at their school was the knowledge of how to use the technology (78.5%).

Research question 2 addressed the perceptions of the senior pre-service teachers and their technological abilities in the selected Union Conference of SDA tertiary institutions.

10. Fifty-two percent of pre-service teachers said they would most likely be at place of residence when they access the Internet for professional tasks. However 28.0% say they would be in the classroom when they access the Internet for professional work.

Teachers' Use of Technology

11. The technology product used the most in a typical work week by pre-service teachers was the cell phone. They were also very active users of the Internet. However, about 80% of them had never or seldom used Internet tools such as listservs, discussion boards, chat rooms, and blogs.

Teachers' Technology Preparation

12. Pre-service teachers' perception of themselves as being prepared in their current teacher education program to use technology was very high. More than two-thirds (70.0%) felt they were adequately prepared to use advanced technology in their teaching.

13. Eighty-four percent of the pre-service teachers perceived themselves to be well prepared to use technology as productivity tools (e.g., how to use email, spreadsheets, presentation software, etc.). However, only half of them (50%) perceived themselves to be prepared to use technology as an integration tool into the curriculum (generally) or as an integration tool into specific content areas.

14. Pre-service teachers (52.0%) perceived themselves to be adequately prepared to handle plagiarism as a security issue and half felt they could adequately handle pornography. Similarly, half disagreed or strongly disagreed that they were adequately prepared to handle online bullying, privacy invasion, advertising and spam, hacking and viruses.

15. In effective use of technology software, 90.9% of pre-service teachers perceived themselves to be adequately prepared to use technology software to do research, prepare, and present lessons. However, 78% perceive themselves adequately prepared to use software technology for keeping records such as grades and attendance, while more of them 86% perceive themselves prepared to use software technology for word-processing, handouts, and other materials.

16. Over 55.0% of the pre-service teachers disagreed or strongly disagreed that they are prepared to use software technology such as online content providers, for example, PLATO, and even school content providers like Blackboard to enhance their work.

17. In the matter of handling advanced technology, 82.6% of pre-service teachers perceived they were adequately prepared to handle general search engines (e.g., Google).

Of those responding, 52.1% of them disagreed or strongly disagreed that they were prepared to handle online classes.

Technology Availability for Use at the Institution

18. Pre-service teachers were satisfied that technology was available at the institution. Of those responding, 87.0% perceive that working computers are readily available at the institution to enhance their preparation. About four-fifths (82.6%) perceive that computers are in a secured location; 78.3% perceive that there were enough computers to enhance their preparation as teachers and there was adequate software to facilitate preparation for teaching and learning. However they all perceived that the important things needed in the future would be: (a) Fast, wireless Internet access throughout the school, (b) new up-to-date software, and (c) adequate technology maintenance and support.

19. More than 90.0% of pre-service teachers perceived that the next most important thing in planning for future technology at the school was accessibility to a wide range of technology devices, a new computer for every teacher, digital cameras, video equipment for teachers to borrow, access to the school's network from place of residence, scheduling teacher development time for learning with technology, and a film studio with all of the appropriate software and equipment.

CHAPTER 5

SUMMARY, DISCUSSION, AND CONCLUSION

Introduction

This chapter gives an overview of the research and the significant findings and considerations of these findings in terms of the study's research questions. This chapter presents recommendations for practice and future research.

This generation of students in secondary schools and those entering college are more knowledgeable, skillful, and exploratory with technology than previous generations (Speaker, 2004). "It is these students who are present in college classrooms and their expectations and learning styles demand changes in the traditional teaching paradigms" (Speaker, 2004, p. 241). Pinnock (2006) stated, "No other phenomenon has had the total impact on society like technology has during [the past] century" (p. 84).

However, the research shows educational systems are currently grappling with the impact of technology on their mode of operation and the status quo. Pinnock (2006) also found that the issues that are foremost in school considerations include a budget to meet the cost of the technology, training for teachers in the use of technology, and the support needed to sustain computer integration in the classroom.

These problems may also exist in the Seventh-day Adventist school system. There are many obstacles that may contribute to this which may include finance, lack of vision,

fear of use, and, even more so, training and support. This research looked at the perceptions of pre-service teachers and secondary students on their use and experience with multimedia and emerging advanced digital technologies in and out of the classroom as they relate to teaching and learning.

Purpose of the Study

This study compares the perceptions of high-school students and pre-service teachers concerning their use of technology. Specifically this investigation explored the perceptions of pre-service teachers and students about their advanced technological abilities based on the criteria as determined by the framework of NetDay (2005) and Intel (2005). This research looked at the perceptions of pre-service teachers and the perceptions of secondary students on the use and experience with multimedia and emerging advanced digital technologies in and out of the classroom. It also looked at the obstacles they experienced in the use of technology in their school environment as it relates to teaching and learning.

Overview of Literature

Describing Tech-Savvy Students and Teachers

Tech-savvy is a term used in literature with reference to describing persons born in the Net-Generation or individuals who have knowledge and skills in the use of technology products used for productivity and communications, or who understand well how to use these products and how they work (National Education Technology Plan, 2006; NetDay, 2004).

In this study I have defined tech-savvy as (a) having the ability to use technology

for problem solving, evaluating, and enhancing productivity, (b) having an understanding of the nature, usability, and operations of technology systems in their relative environments, and (c) having an understanding of how to process and manipulate data and information, using some form of available technology.

The terms tech-savvy and technology-savvy have been used interchangeably in literature (NetDay, 2004, 2005; Pew, 2004, 2007), while tech-savvy is the shorter form for the term. For the purpose of this study, tech-savvy is used in reference to students and teachers in the academic context of educational technology. Attempts to define technology-savvy students often skirt the edges of a real definition.

Issues Relating to Students and Pre-service Teachers

Lancaster said that "computers have changed the way students learn and have become valuable educational tools" (Lancaster, 2006, pp. 3, 4). Thomas et al. (2007) suggested that "teachers are turning technology devices into learning tools and a major milestone was reached when it was noted that teachers are using technology in the classroom" (p. 4).

Literature from Teo (2008) reported that through individualized instruction by the teacher, technology training can improve student learning and enhance the integration of technology into the classroom curriculum. Teo also suggested that the success of student learning with computer technology will depend largely on the attitudes of teachers and their willingness to embrace the technology (p. 127).

The literature review assessed the influence of multimedia tools in enhancing cognitive skills. Presently, multimedia technology seems to influence growth and development of powerful cognitive tools in the place of residence by adults and students.

This may be spilling over into schools. Research indicates that while there are poor uses of technology in education, appropriate technology use can be very beneficial in increasing educational productivity (Valdez, 2004, p. 1). In his introduction to the *Visions 2020.2 Report*, Secretary of Education Dr. Rod Paige noted the following:

> Schools remain unchanged for the most part despite numerous reforms and increased investments in computers and networks. The way we organize schools and provide instruction is essentially the same as it was when our Founding Fathers went to school. Put another way, we still educate our students based on an agricultural timetable, in an industrial setting, but tell students they live in a digital age (*Visions 2020.2*, 2005).

Hannum (2007) suggested that computers do have some attributes that, when used correctly, can facilitate students' learning beyond what would otherwise be likely. Despite increased access to computers and related technology for students and teachers, schools experience difficulty in effectively integrating these technologies into existing curricula. Hannum identified the obstacle of a lack of teacher training as one of the greatest roadblocks to integrating technology into a school's curriculum (p. 13).

Teo, Lee, and Chai (2008) argued that teachers often view the computer as a tool to accomplish housekeeping tasks, manage their students more efficiently, and communicate with parents more easily. The success of student learning with computer technology will depend largely on the attitudes of teachers and their willingness to embrace the technology (Teo et al., 2008). Teo et al. (2008) suggested that gaining an appreciation of the teachers' attitudes towards computer use may provide useful insights into technology integration and acceptance and usage of technology in teaching and learning (pp. 137, 139).

Garay and Odic (2007) suggested that the assumption underlying our educational systems is that the knowledge gained in our schools will be available in the future and will be applied to the solution of new problems as they arise both in school and in real life situations. Research in the past decade has shown that computer technology is an effective means for widening educational opportunities. Technology today allows students to access information that would have been impossible to obtain even 10 years ago.

Bauer and Kenton (2005) show that virtual libraries provide ready access to reference materials including encyclopedias, magazines, professional journals, newspapers, historical records, and primary sources. Electronic databases and powerful search engines guide student researchers to locations where they can access informational media as well as text; they can view documents, photography, video clips; they can hear speeches, sounds, and music (pp. 519-522).

Glover and Oliver (2008) suggested that real-time data collection is also possible, allowing novice investigators to operate as professionals as they access data from weather satellites, space probes, and topographical maps that are updated daily. The world of information is literally at their fingertips. The literature is also suggesting that students can also generate and manipulate data using technology in the process of learning and instructions (pp. 4951-4953).

There are several reasons why teachers are expected to know and use educational and/or instructional technology, especially those technologies related to computer use for accessing and finding information and for creating and communicating new knowledge to students. Research indicates that these reasons may include the following: (a) the need to

prepare students to function in an information-based, Internet-using society; (b) the need to make students competent in using tools found in almost all work areas; and (c) the need to make education more effective and efficient (Valdez et al., 2007).

Most educational researchers, especially those who have examined large numbers of studies such as Kulik (2002), agreed that "if used appropriately, technology can improve education" (p. 2). Literature shows that some teachers struggle with the gap between training in technology and getting the proper hardware and/or software to use in their classrooms (Scott, 2009). This research showed that there are challenges and/or obstacles in the teaching and learning environments that challenge the ability to effectively incorporate technology into instruction and this could be true in the Adventist education system as well.

It appears that from the profile study Adventist education is experiencing changes from the garage onto the Information superhighway. In response to the question asked in the profile studies questionnaire "Where on the superhighway were they?" the results showed that although 9 in 10 use a computer with a printer, there is still more progress to make since the profile stated that a third of all K-12 teachers use computers (Brantley & Burton, 1994, pp. 19, 20).

As a new technology age advances, Adventist educators must prepare themselves and their students for the emerging and advanced technology that is eminent. Planning and integration of curriculum, labs, and training programs must be adequate for the development of the teachers and students to survive in this competitive age of technology and innovation. Brantley and Burton (1994) in the Profile Studies '93 report stated that "educational technology and equipment are now quite readily available in the classrooms

and schools" (pp. 19, 20). This seems to describe the current status of technology in the Adventist education system (Burton et al., 2005).

Therefore, technology needs to become a natural part of pre-service teachers' total learning environment to meet the needs of the students who may be tech-savvy and ready for the challenges of using technology in their classroom or course work. All teachers should enter the classroom ready to use technology to enhance the pupils' learning (Nilsson, 2008, pp. 1282-1283).

Method

This study used the survey research design method to examine the perceptions towards the use of technology based on the NetDay SpeakUp studies (NetDay, 2004). As this study investigated students' and pre-service teachers' perceptions of technologies used in and out of the classroom, the survey research design was used to obtain information from students and pre-service teachers (Intel, 2004; NetDay, 2004; PEW Research, 2004).

This study gathered information related to the status of technology use by pre-service teachers and by 11th- and 12th-grade students. These research data were collected through surveys of students and pre-service educators. Students were asked to participate through the school principals, and pre-service teachers were asked to participate through their department chairs at their schools. Time was scheduled for participants to take the 10-15 minute surveys. The surveys were collected and analyzed for creating this report on the perceptional views of 11th- and 12th-grade students, and pre-service teachers in teacher education institutions of the selected Union of the Seventh-day Adventist education system.

Population and Sampling

In the NetDay (2005) study, a multistage sampling design was used which consisted of the following stages: (a) selection of a geographic area; (b) selection of schools drawn from non-public schools within the selected area, and (c) selection of students within the schools that were chosen. The current study used a similar approach to this three-stage strategy indicated above: (a) selection of two Union Conferences from the nine Unions in the North American Division of Seventh-day Adventists; (b) random selection of schools randomly drawn from the boarding and day academies within the selected Union; (c) selection of all students in 11th-and 12th-grades from the randomly selected schools. By default all senior-year pre-service teachers from teacher education programs in the selected Union were included in this study. Each stage of this multistage sampling procedure is described in detail below.

Research Questions

The following three research questions guided this study:

1. What are the perceptions of high-school students' use of technology and their advanced technological abilities in a selected Union Conference of the Seventh-day Adventist education system?

2. What are the perceptions of senior pre-service teachers' use of technology and their technological abilities in a selected Union Conference of the Seventh-day Adventist education system?

3. What selected variables contribute to the advanced technological abilities of students and pre-service teachers in this selected Union Conference of the Seventh-day Adventist education system?

These questions guided the development of the survey for those who participated in the research among the 11th- and 12th-grade students and the pre-service teachers.

Instrumentation

Two questionnaires were used in this study. They were (a) a questionnaire for measuring students' perceptions of the teaching and learning process in the use of multimedia and emerging digital technology, and (b) a questionnaire for measuring pre-service teachers' perceptions of their use of multimedia and emerging digital technology. The items on the questionnaires were adopted from a number of studies (Bergeson, 2002; NetDay, 2005; Pew, 2004) that investigated the perceptions of the teachers and students.

The students' questionnaire designed for this study consisted of 12 items of which 7 provided information on the demographics of the students; the remaining 5 provided information on the students' perceptions of their use of technology in their place of residence and in school. Most of the items in the instrument used a variation of the selected-response format using a Likert scale. The areas included in the student questionnaire were (a) demographic, (b) use of technology at school, (c) use of technology at home, (d) use of technology in subject areas at school, (e) use of the Internet in general, and (f) obstacles experienced in using technology at school.

The teacher questionnaire designed for this study consisted of a total of 16 items of which 6 provided information on the demographics of the pre-service teacher; the remaining 10 provided information on their perception on the use of technology in the place of residence and school. Most of the items in the questionnaire used a variation of the Likert scale. The domains addressed in the teachers' questionnaire were (a) demographic, (b) use of technology on a regular basis, (c) use of technology at work, (d)

use of the Internet, (e) satisfaction with technology preparations in school program, (f) preparation to use technology in specific areas, (g) preparation to handle computer security issues, (h) preparation to use technology effectively as a support tool, (i) preparation to use technology to help with teaching, (j) availability of technology in the work environment, and (k) designing a computer lab in a new school.

The internal consistency of the instruments was calculated by using Cronbach's alpha and the reliability coefficient obtained for each instrument was $r^2 = 0.86$. It should also be noted that an alpha of .8 is probably a reasonable goal. Allen and Yen (2002) stated, "Cronbach's alpha is an index of reliability associated with the variation accounted for by the true score of the underlying construct." According to Santos, et al. (1998), "reliability tests are especially important when derivative variables are intended to be used for subsequent predictive analyses" (p. 2).

Findings

Respondents

Demographics of Students

Students submitted 191 surveys representing a 51% rate of return. More than half of the students were in Grade 12 (61.3%), while less than half came from Grade 11 (38.7%). More than half of the students were females (56.5%), while 43.3% were males. The two kinds of schools were day and boarding schools. More than half of the students came from boarding schools (56.0%); the remaining respondents came from the day school (44.0%).

Demographics of Pre-service Teachers

Surveys submitted from tertiary schools in the selected Union of SDA were 25, representing a 93% rate of return. The majority of pre-service teachers came from Tertiary B (56.0%), representing more than half of the participants; those from Tertiary A were less than half of the participants (44.0%). The participants' ages ranged from 18 to 26+ years of age. Those between 18 and 21 were less than half (44.0%), and those from 22 to 25 years old were also less than half (44.0%), while less than a quarter of the participants came from the 26+ age group (12.0%). A large part of the group, more than two thirds, were females (68.0%), while less than a third of the group were males (32.0%).

Tertiaries A and B were represented by only two ethnic groups. More than half were African-Americans (56.0%) and the remainder were Caucasian (44.0%). The respondents were asked what projections they have after completing training regarding the level of teaching they hope to enter. The largest group of pre-service teachers is preparing to teach at the Grades 3 to 5 (40.0%). Next was the K-2 and 9-12 levels which had less than a quarter each (24.0%). The remainder were thinking of entering the 6–8 grade level (12.0%).

Research Question 1

The first research question asked, "What are the perceptions of high-school students' use of technology and their advanced technological abilities?"

Almost all (96.4%) the students in Grades 11 and 12 consider technology as important for their education. A small group (3.6%) seems to have significantly different views on technology and their education.

About half of the students (50.8%) claim to get help with their school work using technology at school more than at home, while less than half (46.1%) said they get help from home.

The students' report showed that almost half of the students (47.5%) use the computer lab at school more than classroom computers or library computers. Few of the students (2.6%) seem not to use computers regularly at school.

In response to the question "What do you regularly do with technology during your free time?" the top vote-getters were the following:

1. Talking with or e-mailing friends and/or family (50.8%)
2. Listening and downloading music (19.9%)
3. A cluster of categories which each received less than 10% of the students' responses: gaming, getting information, and doing homework.

What was interesting is that 6.8% of the students did not do anything with technology in their free time at school.

More than half (56.0%) indicated that they use a desktop computer in school regularly, while less than half of the students (42.0%) use laptops in the classroom. Other areas of interest included the following:

1. IPods (25.0%)
2. MP3 players (21%)
3. CD burners (16%)
4. Scanners (11%)
5. PDAs and Camcorders (8% or less).

These data show that almost half of the students have access to technology in the classroom at school and can use various types of technology.

Research Question 2

Research question 2 asked: "What are the perceptions of senior pre-service teachers in their technological abilities?"

In response to the question, "What technology products do pre-service teachers use in the education program on a regular basis at school?" more than two-thirds (88.0%) of the teachers indicated using technology to talk/email with friends and about two-thirds of the teachers (83.0%) indicated using technology to find out about current events. Other areas where technology products were used by more than half of the teachers included getting information about events (64.0%), listening to and downloading music (62.5%), and graphic design and photography (56.0%). From 25.0% to 36.0% of the teachers felt prepared to use technology in other areas such as updating their personal webpage, looking for or applying for a job, online banking, personal research, and participating in online meetings.

In response to the question, "What technology products do pre-service teachers use in the education program on a regular basis at their home?" more than three-quarters (88.0%) of the teachers chose the cell phone as the most used product on a daily basis in a typical week at their home. More than half (56.0%) chose the laptop computer. Third on the list were desktop computers (36.0%). Other products were used by less than 13.0% of the respondents: digital cameras, video cameras, scanners, and smart boards.

In response to the question, "What Internet technology tools do teachers use in a typical week of work to enhance teaching and learning?" more than half (58.0%) of the

teachers selected search engines; more than half (52.0%) also selected email. Next on the list were discussion boards (52.0%) and specific Internet websites (44.0%). Interestingly from 48.0% to 77.0% of the pre-service teachers selected web logs (blogs), chat rooms, discussion boards, and listservs and as "Never used" or "Hardly used."

In response to the question, "How do teachers feel about the school pre-service preparation program that prepared them to use technology tools to enhance teaching?" less than three-quarters (70.8%) of the teachers agree or strongly agree that the school pre-service teachers' program is preparing them for teaching, while a small group (8.3%) of the pre-service teachers felt that the school does not prepare them for the use of technology for teaching.

In response to the question, "Do you consider yourself well-prepared by the school program to use technology related tools to enhance teaching?" more than three-quarters of respondents (84.0%) indicated (Agree or Strongly Agree) they feel they are prepared to use computer productivity tools. Almost three-quarters (72.0%) believed they can handle using integrated technology tools in specific curriculum-related work, while about two-thirds (68.0%) believed they can handle using integrated technology tools in general curriculum-related work. A little more than half (52.0%) felt they can use instructional technology tools and less than half (44.0%) believed they can handle using technology instructional tools for management of their classroom or work.

In response to the question, "Does your ability to handle security issues in the classroom or at the school result from or relate to the use of technology?" almost two-thirds (60.0%) of the teachers did not believe (Disagree or Strongly Disagree) that they are able to handle online bullying. High on the list, also, were hacking and viruses. More

than half (56%) did not think they are ready to handle these issues. Next on the list were advertising and spam, where more than half (56%) did not think they are prepared to handle these issues. Other areas teachers feel less able to handle were privacy invasion (52.0%) and digital divide issues (54.0%). The area teachers feel most comfortable handling is plagiarism, with over half of the respondents (52.0%) responding affirmatively.

In response to the question "Has the preparation program adequately prepared you to use technology products regularly and to handle software productivity issues?" more than three-quarters (82.6%) of the teachers were comfortable with their preparation to use general Internet search engines. Next on the list was subject-specific software, including word processing (68.2%) and streaming video where more than half (52.1%) of the teachers felt they were prepared to use this software in preparation for teaching. Software areas the teachers felt they were less prepared to use included online classes (30.4%) and online simulations (31.0%) (see Table 34).

In response to the question, "Do you feel you have been adequately prepared to use technology as a tool on a regular basis at school?" more than three-quarters (82.6%) of the teachers felt adequately prepared to use general search engine tools. More than half (68.2%) of the teachers felt adequately prepared to use subject specified tools, for example, Math plus, Reading plus (see Table 34).

In response to the question, "What is readily available at the institution to enhance learning and teaching?" more than three-quarters (87.0%) of the pre-service teachers taking the survey indicated (Agree or Strongly Agree) that working computers are available at the institution where they studied. More than three-quarters felt that

computers were in secure locations (82.6%). About three-quarters (73.0%–78.0%) of the teachers indicated (Agree or Strongly Agree) that the institution had enough computers that are fast and reliable, adequate software, and enough time in the school day for the use of technology (see Table 36).

In response to the question, "In designing a new lab or a new school, what technology is important for teachers to have available on a regular basis to enhance learning and teaching?" all the pre-service teachers (100.0%) chose having fast, wireless Internet access, new updated software, and adequate technology maintenance as being important. About three-quarters (75.0%) felt the following were also important: a new computer for teachers, digital cameras, video equipment for teachers, scheduled teacher development, and access to the school's network. Only a little more than one-third (39.1%) thought it was important to have a hand-held device for teachers or a laptop for every student (see Table 38).

Research Question 3

Question 3 asked, **"**What selected variables contribute to the advanced technological perceptions of students and pre-service teachers?"

To answer this research question, two linear regressions were run, one for students and one for pre-service teachers. To determine if a linear regression would be appropriate, a correlation test was first run for the students between overall tech-savvy scores and technology variables of the perception of students. Three significant correlations were found as follows: (a) products used on a regular basis at school, $r = .83$, (b) products used in all subject areas, $r = .58$, and (c) experiences in Internet use, $r = .84$. Based on these strong correlations, I then moved to a linear regression analysis.

For the students the results of linear regression revealed that the best of the three predictors indicating the savvyness of the students were their experiences in using the Internet as a tool to do a number of activities relating to school. The other two predictors were how they used technology products on a regular basis to participate in many activities and their use of technology in subject area at schools. The students base their opinions on the use and experiences gained in and out of the classroom. These usages account for 96% of the variance in the tech-savvy ability with $\beta = 14.92$. Since β was significant, the null hypothesis was rejected.

For the pre-service teachers, the results of linear regression revealed that the best of the three predictors indicating the savvyness of the pre-service teachers was how prepared they feel they are to use technology as a tool to help them in the teaching process. The other two predictors were the pre-service teachers' use of technology to do a range of activities on a regular basis, and their perceptions of their preparation to use technology as a productive, instructional, and integrating tool. The pre-service teachers based their opinions on the practice and confidencies gained in the preparation and use of technology on a regular basis and showing computer competencies in using technology by performing effectively in preparation to teach and school activities. These usages account for 94% of the variance in the tech-savvy ability with $\beta = 0.53$. Since β was significant, the null hypothesis was rejected.

Discussion

Question 1

Of these students, more than a half of the boarding-school students (67.3%) said they would be using computers in the lab when they were at school. Of the day-school

students, more than a half (61.9%) indicated they would most likely be using computers in the classroom (see Table 7). This difference may be due to the type of school. Day schools may have small computer labs in each classroom, while boarding schools may have larger or centralized labs in different areas of campus for access during and after classes. Andrade (2006) suggests that this generation of learners has challenged conventional educational approaches (p. 39) and computers are now available in almost all schools.

Bitter and Legacy (2008) suggested that computers are a vital part of our society today (p. 35); this may be why more than half from the boarding-school students (55.1%) and less than half of day-school students (45.2%) stated they would use technology for emailing friends and family (see Table 8). Boarding-school students may be using technology to keep connected to friends and family while day students are home with friends and family. In NetDay's survey responses, 65% of the students use email and instant messenger every day. According to NetDay, students are surpassing their teachers in using technology for communication. While 95% of teachers comfortably use email, students are moving on to more or less formal forms of communications such as text messaging, depending on the task at hand (NetDay, 2005).

Although computers are everywhere (Scherer, 2009), it appears that students in secondary schools have access to more computer technology at their home than at school. This may be due to budget constraints and a resulting lack of technology in the schools. At their home, students may have more game-related experience while they may not be able to play games at school. Thus, they spend more hours on campus doing school

activities (see Table 7). While at school, 45.5% of the students use technology in a computer lab and 33.5% used computers in a classroom.

The facts that labs have limited access for students may contribute to these findings of using the home-based technology more than school-based technology for school work. NetDay (2005) findings showed that more than three-quarters (84%) of the nation's students said they use technology regularly as part of their school work but only 27% indicate that school is the prime location for that activity. The current study revealed a similar pattern, where the home is the preferred location.

Scherer (2009) suggested that computers are a necessary and invaluable resource for teachers and students, yet day-school students said that knowing how to use technology was their biggest obstacle in using technology at school. Boarding-school students said their greatest obstacle was lack of fast access, while they also complained there were not enough computers (see Table 18). This second finding was similar to NetDay SpeakUp (2005) findings where the greatest obstacle was slow Internet access. However, NetDay did not find that inadequate access to computers or knowing how to use the available technology was a problem. It seems that a slightly different set of obstacles is present in Adventist high schools compared to national schools (NetDay, 2005).

Boarding-school students are perceived to be more advanced with technology ability skills than day-school students. This relates to technology use at the home, on the Internet, and in special subject areas (see Table 20). Boarding-school students may have computers in their rooms or in labs located in various locations which may have Internet

or network access. This is supported by NCES (2009), which reported that 99% of all schools have access to computers and have Internet access.

Although male students seem to be more advanced technology users than female students (see Table 21), there seem to be similarities between the national trends and Adventist students. NetDay (2007) describes this as being not merely technology-savvy, but approaching their lives differently as they integrate digital technologies—computers, the Internet, instant messaging, cell phone, and email—seamlessly throughout their daily activities.

Although Bryant (2009) has suggested that schools and teachers have taken up the challenge of finding a creative use for technology, this research found that patterns of use are different between the two groups of high-school students. Boarding-school students use computers to talk and email friends more than day-school students, while day-school students use technology more for listening to and downloading music.

The findings that are similar to NetDay (2006) findings were that communication and entertainment is a key motivator for students and drives their use of technology for learning and/or personal use. By using computers, students today have access to the Internet and productivity tools at their home and at school. Lancaster (2006) suggested that students can process information and solve problems, develop multimedia projects, and increase personal productivity. Computers have changed the way students learn and have become valuable educational tools (Lancaster, 2006). This process seems to be taking place in schools in the North American Division of Seventh-day Adventists.

Question 2

There is a significant difference in the perceptions of pre-service teachers by institution as to having been adequately prepared to use technology regularly. Tertiary B pre-service teachers use more technology to research information, conduct student assessment, and access educational websites than Tertiary A pre-service teachers (see Table 27). Tertiary B seems to have differences in the engagement of its students with technology as compared with Tertiary A. This may be due to curriculum requirements and meeting these requirements by pre-service teachers through schedules in the institutions.

Pre-service teachers at Tertiary institution A used more Internet technology with email than those at Tertiary B institution (see Table 29). Tertiary B pre-service teachers, however, use more technology productivity tools than Tertiary A pre-service teachers on a regular basis. Tertiary B pre-service teachers also integrate technology tools into the curriculum in a general way and into curriculum for specific areas than do Tertiary A pre-service teachers on a regular basis (see Table 33). The pre-service teachers have fast wireless Internet technology available for use at the Tertiary B. They indicated that they have more Internet technology available for use than those in Tertiary A (see Table 39). It would seem that these institutions are at different levels in the acquisition and use of technology for professional work. This may be the reason for Tertiary B pre-service teachers' perception that they are more tech-savvy than those at Tertiary A.

Pre-service teachers (52.0%) perceived themselves to be adequately prepared to handle plagiarism as a technology security issue; however, less than half (40%) of them perceived they were prepared to handle pornography issues and more than half (54%–

60%) agreed that they are not adequately prepared to handle online bullying, privacy invasion, advertising and spam, digital divide issues, hacking, and viruses (see Table 32). Tertiary B pre-service teachers seem to be more prepared to handle security issues than Tertiary A teachers in all issues except in piracy and illegal download of software. This may be due to the absence of security issues or because the school has exceptionally good policies and procedures in place for the use of technology at Tertiary A making these non-threatening issues.

Although Recesso and Orrill (2008) refer to technology to include audiovisual, media, and technological items that can be used in the classroom, it was interesting to note that pre-service teachers did not use many of the technology products listed on the survey. Some respondents indicated that some products, such as online simulations and online classes, were hardly used (see Table 34).

More than half (52.0%) of the pre-service teachers say they would likely be at their home using technology for professional tasks (see Table 11). There seem to be similarities in the national trend where more than one-third (36%) of teachers use computer technology at their home to do professional activities. This could be due to a lack of technology products at school or because they are fearful in using these products, or fear of failure in the presence of students or peers. In fact, studies by Whitehead et al. (2003) have shown that limited up-to-date hardware and software, limited infrastructure and technical support staff, ineffective integration of technology into curricula, lack of compatibility among computers, lack of staff development, reluctance toward using technology, and ignorance towards its significance by teachers have severely hampered the use of technology with success in teaching and learning (pp. 481-482). That could explain why they placed maintenance and support high on the list for the new school or the new lab.

This study also found that male pre-service teachers had higher advanced technology usage (tech-savvy) scores than the female pre-service teachers (see Table 40). This pattern was also found among high-school students. This may be due to the computer games and online gaming that most males do out of class. To do this, they spend more time web surfing and webpage building at their home. Swan, Kracoski, and Hooft (2007) found in their research that students and teachers use the new technologies far less in the classroom than they do at their home and those pre-service teachers who use computers for instruction do so infrequently and unimaginatively.

Top technology products shared by both teachers and students include the desktop computer, the cell phone, and the DVD burner (see Table 24). It seems that because of the use of technology in the home and in the personal experiences of the pre-service teachers and students, these items seem to be the most used because of their personal acquisitions of technology for their personal use and comfort. NetDay SpeakUp (2006) found that teachers' professional use of technology is approaching a comfort level but is not keeping up with the advances in how young people are using technology. Similarly, Coufal (2002) noted earlier that students have been observed to be far more skilled at applying digital multimedia than teachers who have been teaching them (pp. 29-30). This is why it is necessary to provide updated technology for our teachers with support and follow-up after the various training programs.

Research by Starr (2009) indicated that about half of U.S. teachers use technology in classroom instruction. However, Sullivan and Hache (2004) suggested that teachers need to prepare themselves and students by keeping up with new advances in technology. Research also shows that pre-service teachers are keeping up in and out of the classroom.

Question 3

In this research, the results of linear regression revealed that the best of the three predictors indicating the savvyness of the students was their experiences in using the Internet as a tool to do a number of activities relating to school. The other two predictors were how the students used technology products on a regular basis to participate in many activities and their use of technology in subject areas at school. It is possible that the practice and experience from their home may have given the students the practice and confidence to use technology on a regular basis; these skills are then transferred to school to do special activities and give competencies in using technology in subject areas for classes.

The students' responses show computer competences in using technology by performing effectively in their school activities. In another context, NET-S suggested that students can be considered technologically savvy if they meet the standards developed by National Education Technology Standards for Students (NETS-S) (ISTE, 2007).

Based on the standards set by ISTE (2007), a student with advanced technical ability (tech-savvy) according to the International Society for Technology in Education (ISTE) reflects the following six National Education Technology Standards for Students (NETS-S):

1. Creativity and Innovation: Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. (ISTE, 2007)

Table 12 shows more than half of the students taking the survey indicated they use technology products regularly (Desktop computers, Laptop computers, and Cell

phones [advanced features]) at their home and at school. More than one-quarter use other technology products on a regular basis at school and at their home.

2. Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. (ISTE, 2007)

More than half of the students use technology products while using the Internet as a communication tool (writing reports, visiting the school website, using IM to talk to friends and/or family, emailing teachers, checking on class grades) on a regular basis (see Table 16).

3. Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information. (ISTE, 2007)

Over half of the students said they use technology products effectively in subject areas (English, Science, and Social Studies/History) (see Table 14).

4. Critical Thinking, Problems Solving, and Decision Making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. (ISTE, 2007)

More than half of the students use technology products while using the Internet as a communication tool (writing reports, visiting the school website, using IM to talk to friends and family, emailing teachers, check on class grades) on a regular basis (see Table 16).

5. Digital Citizenship: Students understand human, cultural, and responsible use of information and technology. (ISTE, 2007)

In their free time, half the students talk or email friends and family while more than 10% of the students use technology in a responsible way to gather or disseminate information during their free times (see Table 8).

6. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems, and operations. (ISTE, 2007)

More than one-third get help for doing their school work at their home or at home with the use of technology (see Table 6). These activities have directly or indirectly contributed to the savvyness of the students' use of technology.

The results of linear regression revealed that the best of the three predictors indicating the savvyness of the pre-service teacher was how prepared they feel they are to use technology as a tool to help them in the teaching process. The other two predictors were the pre-service teachers' use of technology to do a range of activities on a regular basis and their perceptions of their preparation to use technology as a productive, instructional, and integrating tool.

The pre-service teachers based their opinions on the practice and confidences gained in the preparation and use of technology on a regular basis, thus showing computer competencies in using technology by performing effectively in preparation to teach and school activities.

A teacher can be considered to have advanced technical ability (tech-savvy) if he/she meets the following five standards developed by the National Education Technology Standards for Teachers (NETS-T) (ISTE, 2008).

Based on the five standards developed by International Society for Technology in Education (ISTE) and the National Education Technology Standards for Teachers (NETS-T), teachers should:

1. Facilitate and Inspire Student Learning and Creativity: Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments. (ISTE, 2008)

More than half of the pre-service teachers perceived they were capable of using technology products to facilitate and inspire student learning and creativity (talk/email with friends and family, get information about events, get information about current events, listen to and download music, use graphics and photos, and do personal research) (see Table 22).

2. Design and Develop Digital-Age Learning Experiences and Assessments: Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS-S. (ISTE, 2008)

   More than three-quarters of the pre-service teachers said they use word processing, digital grades, records tools, research and presentation tools, while more than half say they use technology to do special needs research, conduct student assessment, research information for student development, and do project-based learning (see Table 26).

3. Model Digital-Age Work and Learning: Teachers exhibit knowledge, skill, and work processes representative of an innovative professional in a global and digital society. (ISTE, 2008)

   Pre-service teachers show they can use technology products that require skill and knowledge in a digital society. More than one-third said they use desktop computers, laptop computers, cell phones, digital cameras, DVDs or CD burners, and MP3 or IPOD players. These require skill in operation and can be used in or out of the school (see Table 24).

4. Promote and Model Digital Citizenship and Responsibility: Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices. Teachers use technology to enhance their productive and professional practice. (ISTE, 2008)

More than one-third of the pre-service teachers show that they are prepared to handle major social and security issues relating to ethics and professional practices in the classroom (privacy invasion, advertising and spam, pornography, and plagiarism) (see Table 32).

5. Engage in Professional Growth and Leadership: Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources. (ISTE, 2008)

More than two-thirds of the teachers believe they are prepared to use the following types of professional tools in an effective way: productivity tools, instructional tools, integrating technology tools for curriculum, and integrating technology tools for specific curriculum areas (see Table 30). Literature from Brown and Warschauer (2006) argued that there is a continuing demand for better preparation of pre-service teachers in the information age.

Conclusions

What do we know about Adventist high-school students through this study? They are active computer users, and they use desktop computers and laptop computers more regularly at their home than at school. They may not have a variety of technology at school but seem to have a variety of technology at their home since they use more computers there than at school. They are perceived to be savvy users with the technology available to them, although they did not have a great range of experience using much of the technology referred to in the survey.

They seem to have an interest in knowing how to use the technology at school since they said that not knowing how to use the technology was an obstacle to their

productivity. Male students' appear to be more savvy than female students and this was due to the various out-of-school technology they were using and/or exposed to. The results from this study reaffirm that there is a need for more training and support in the use of technology integration and interaction in Adventist schools.

What do we know now about the preparation and use of technology by pre-service teachers because of this study? Pre-service teachers feel that the preparation programs at our schools are adequately preparing them for the classroom of technology but they are still using more computers at their home than at school to do professional preparations (see Table 11). It is important to note that the pre-service teachers in this study do not feel adequately prepared to handle most of the social and security issues in the classroom (see Table 32).

They would support faster and newer updates of hardware, software, peripherals, and support in the institution if there were considerations for a new lab or new school. They support a lab that would be open after school and during the weekends for professional practice and preparations for their teaching in the classroom. This is why teachers' training programs should include training in computer security issues and how to handle these issues in the computer environment at school.

What do we know about predictors of levels of tech-savvyness for both pre-service teachers and students because of this study? Although students are not exposed to a wide variety of technology hardware and software tools at school, they still appear to be tech-savvy in the things they use and can do with technology. The best predictors of their savvyness were the products used regularly, followed by their experience in Internet use, and finally, the products used in all subject areas. The exposure of pre-service teachers to

technology tools and how they seem to be tech-savvy in the things they can use and do was important to them.

The predictors of their savvyness were how comfortable they felt with the preparation they had in using technology to help them teach, followed by regular use of technology in the classroom and at their home and their feeling of being prepared to use technology as a teaching tool.

They are able to use the basic applications for preparation to teach, unlike the students who said they would like to know how to use the available tools at the school. With training in integration and with good interaction, students and teachers can develop competencies in their use of technology as a tool for teaching and learning. Funding remains the major challenge. Schaffhauser (2008) argued that many obstacles exist in the preparation and use of educational technology by students and teachers in schools. In spite of obstacles, many students and teachers are taking every opportunity to learn, use, and understand technology for teaching and learning.

Recommendations for Practice

In making general recommendations and drawing practical implications from this study, it is important to note the nature of research data. Data were measures of respondents' perceptions of their personal use of technology, and their preparation for college or the world of works. The following recommendations are based on the findings of this study:

1. Those educational leaders of colleges and Union Conferences should develop strategies for providing adequate training in the use of technology in education using state-of-the-art technology.

2. Teachers at colleges and academies should explore ways of increasing students' use of technology in the learning process at all levels in the schools.

3. Educational leaders in the Adventist teacher education programs should explore different options for providing ongoing training and support for teachers in pre-service education to enhance effective and efficient use of technology in the schools.

4. Teachers at colleges and secondary schools should explore how social networks can be integrated into the learning process for both students and teachers since students are rapidly moving to social networks; teachers should be trained to integrate subject areas and teaching into state-of-the-art and emerging technology.

5. Schools should develop policies and procedures for handling security issues and, at the same time, teacher training programs should explore ways of including training in computer security and social issues and how to handle these in the computer environment at schools.

6. Other studies by NetDay SpeakUp (2007) and by Pew (2007) reaffirm that what is needed nationwide is additional research to examine the differences and perceptions of pre-service teachers in all schools. This is also recommended as a need in Seventh-day Adventist schools in the North American Division.

Recommendations for Research

Based on the findings of this research, I would recommend that follow-up studies and new research be done in several areas. These are some specific suggestions for research that needs to be done:

1. Examine the differences in types of technology products available in the Adventist school system and its efficiency in teaching and learning. There are strong

indications that students in secondary and tertiary schools do not have access to a variety of equipment that can enhance the challenges they face in education.

2. Determine the training needs of current teachers in secondary schools and what has been done, evaluate pre-service teachers after training, follow up on implementation and their experiences in the use of emerging and advanced technology in teaching and learning.

3. Examine new technology as it is introduced into the community and in schools on an on-going basis, study the effect of contemporary technology use in education, based on gender, age, and ethnicity level, and determine the demographics relating to regions and how new technology use has enhanced teaching and learning.

4. Determine the return on investment for computers in schools, since computer technology is a capital or academic investment in the school system.

APPENDIX

APPENDIX A

LETTERS

Andrews ~ University

November 17, 2006
Alan R. Williams 12559 Red Bud
Trail Buchanan, MI 49107

Dear Alan,

RE: APPLICATION FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS
IRB Protocol #: 06-086 Application Type: Original Dept: Education
Review Category: Exempt Action Taken: Approved Advisor: Larry Burton
Protocol Title: Perceptions of Students' and Teachers' on Paradigm Changes in Technology Selected Division of the World Church of Seventh-day Adventist Schools

This letter is to advise you that the Institutional Review Board (IRB) has reviewed and approved your proposal for research. You have been given clearance to proceed with your research plans.

All changes made to the study design and/or consent form, after initiation of the project, require prior approval from the IRB before such changes can be implemented. Feel free to contact our office if you have any questions.

The duration of the present approval is for one year. If your research 'is going to take more than one year, you must apply for an extension of your approval in order to be authorized to continue with this project.

Some proposal and research design designs may be of such a nature that participation in the project may involve certain risks to human subjects. If your project is one of this nature and in the implementation of your project an incidence occurs which results in a research-related adverse reaction and/or physical injury, such an occurrence must be reported immediately in writing to the Institutional Review Board. Any project related physical injury must also be reported immediately to the University physician, Dr. Loren Hamel, by calling (269) 473-2222.

We wish you success as you implement the research project as outlined in the approved protocol.

Sincerely,

Michael D Pearson
Secretary
Institutional Review Board

Office of Scholarly Research
(269) 471-6360 Fax: (269) 471-6246
E-mail: irb(ii)andrews.edu Andrews
University, Berrien Springs, MI 49104

Andrews University
Department of Teaching, Learning and Curriculum

Verbal Instructions for Giving the Survey

Researcher: Alan R. Williams.
Chair Dissertation Committee: Dr. Larry Burton, Ph.D.

Survey for students instructions:

These will be given by the person chosen by the principal to administer the survey. The person will read the instructions to the students in intact classes where the entire process will take about 10 - 15 minutes.

Instructions on the survey:

> "Please put a check () in the space provided to indicate your best response to the questions below. Do not write your name on this questionnaire."

Survey for pre-service teachers:

These will be given by the person chosen by the department to administer the survey. The person will read the instructions to the pre-service teachers in intact classes where the entire process will take about 10 - 15 minutes.

Instructions on the survey:

> "Please put a check (√) in the space provided to indicate your best response to the questions below. Do not write your name on this questionnaire."

Instructions for Schools:

> The schools will be asked to distribute the consent forms to the students under 18 years old to take to the parent or guardian for approval signature.
> The student upon returning the form, a time will be set for all students taking the survey to participate.
>
> At the end of the survey process in the class. The teacher will put the survey in the envelope provided and seal the envelope. The envelope will be mailed to the researcher in the pre-addressed and stamped envelope.

In all instances the person implementing the survey will inform the participant that they will not put their name or any personal information on the survey. And that confidentiality will not be compromised.

Andrews University

School of Education

Department of Teaching, Learning and Curriculum

Verbal Instructions for Giving the Survey

Researcher: Alan R. Williams.

Chair Dissertation Committee: Dr. Larry Burton, Ph.D.

Survey for students.

Instructions:

To the person chosen by the Dean to administer the survey. You will read the instructions to the students in intact classes where the entire process will take about 10 - 15 minutes.

Instructions on the survey:

> "Please put a check (√) in the space provided to indicate your best response to the questions below. Do not write your name on this questionnaire."

Instructions for Schools:

> The schools will be asked to distribute the survey.
>
> The student upon returning the survey in the envelope provided by the proctor.
>
> A time will be set for all students taking the survey to participate.
>
> Students will be reminded to do both sides of the pages in the survey.
>
> At the end of the survey process in the class. The proctor will ensure that all participants did put the survey in the envelope provided and seal the envelope. The envelope will be mailed to the researcher in the pre-addressed and stamped envelope provided.

In all instances the person implementing the survey will inform the participant that they will not put their name or any personal information on the survey. And that confidentiality will not be compromised.

Thank you.

Is it possible to have from your office the following?

Can you provide a list of schools with enrollment in 11th-and 12th-grades, with types, and if it is day or boarding?
Can you provide also the names and addresses of schools to mail the consent forms and surveys? I try getting this on line through circle. But it is not current.

These two pieces of information will help in the planning process.

At the end of this process we will send you a full report of our findings and if there is any statistical information you would like us to analyze for your office please let us know.

Thank you for this contribution and looking forward to facilitating you with our finding and analysis.

Alan R. Williams (Researcher)
Dr. Larry Burton

Andrews University
Department of Teaching, Learning and Curriculum

School of Education

Academy Student Informed Consent

Title: Perceptions of Students' and Teachers' Perceptions in the use of technology in Education in a Selected Division of the World church of Seventh-day Adventist.

Alan Roland Williams, MS

My name is Alan Williams; I am a doctorial student at Andrews University, located in Berrien Springs, Michigan. My dissertation topic relates to students' and teachers' perceptions of advanced technological abilities. I would like to request your assistance by completing a survey related to your participation in the use of technology.

I have prepared a survey (12 multiple-choice questions) about your experiences. The data collected in this study will be used in my dissertation and may be used in a publication, but will not be use to identify you or the participants of the survey.

Your responses to all of the questions will remain confidential. It does not ask your name or provide for ways to indicate your identity, only your signature of consent. Your participation is voluntary. It should take you no more than 15 to 20 minutes. You may choose to stop participating at any time.

By submitting this survey you indicate that you are under 18 years of age and that you are giving consent to collect and use this data. (If you are 18 years or above you do not need this form). A copy of this form will be returned to you.

If you have any questions about the study you may contact me at williama@andrews.edu / Phone #: 269-471-6798 or Dr. Larry Burton at burton@andrews.edu

I have read this consent form and would like to complete the survey. □

I have read this consent form and I do not wish to complete the survey. □

Signature of participant: _____ Date: _____

Signature of Legal Guardian or Parent: _____ Date: _____

_____ _____

Signature of Investigator Date

Thank you for your assistance on this project.

Alan R. Williams & Dr. Larry Burton

Andrews University
Department of Teaching, Learning and Curriculum

School of Education

Pre-service Teacher Informed Consent

Title: Perceptions of Students' and Teachers' Perceptions on Paradigm Changes in Technology Selected Division of the World church of Seventh-day Adventist Schools.

Alan Roland Williams, MS

My name is Alan Williams; I am a doctorial student at Andrews University, located in Berrien Springs, Michigan. My dissertation topic relates to students' and teachers' perceptions of advanced technological abilities. I would like to request your assistance by completing a survey related to your participation in the use of technology.

I have prepared a survey (16 multiple-choice questions) about your experiences. The data collected in this study will be used in my dissertation and may be used in a publication, but will not be use to identify you or the participants of the survey.

Your responses to all of the questions will remain confidential. It does not ask your name or provide for ways to indicate your identity, only your signature of consent. Your participation is voluntary. It should take you no more than 15 to 20 minutes. You may choose to stop participating at any time.

By submitting this survey you indicate that you are giving consent to collect and use this data. A copy of this form will be returned to you.

If you have any questions about the study you may contact me at williama@andrews.edu / Phone #: 269-471-6798 or Dr. Larry Burton at burton@andrews.edu

I have read this consent form and would like to complete the survey. □

I have read this consent form and I do not wish to complete the survey. □

Signature of participant: _____ Date: _____

Signature of Legal Guardian or Parent: _____ Date: _____

_____ _____

Signature of Investigator Date

Thank you for your assistance on this project.

Alan R. Williams & Dr. Larry Burton

Sample Letter

Dear Principal,

I am a doctoral student at Andrews University in Berrien Springs, Michigan and I am conducting my research in your Union Conference of Seventh-day Adventist. My study will look at perceptions of students and pre-service teachers on the use of advance multimedia and digital technology in the home and school. This study is sponsored by the Southern Union's Education Department and Andrews University. The results of this study will be used to help in developing the curriculum for pre-service teachers to meet the advancing technological needs of the students coming out of our secondary schools.

You are receiving this notice as an academy in the Southern Union of which all 11th-and 12th-graders will be asked to participate. We believe that your contribution will be important and that if students in your school choose to participate, this will contribute to the reliability of this study as a representation of the sampling population of the Southern Union.

We will not only like to share the results of our study with you if you wish, but will also like to offer a small token of appreciation to your school in the form of a thank you gift. Currently we are in the planning stage and would like to know what the population samples of the 11th-and 12th-grades are in your school. This information will help us in sending the correct amount of surveys. We look forward to working with you and your shearing of information to make this project possible.

If you need further information please contact me at phone: 269-471-6798 or e-mail: williama@andrews.edu, or Dr. Larry Burton 269-471-6674 or burton@andrews.edu.

Respectfully,

Alan Williams

Dr. Larry Burton.

APPENDIX B

QUESTIONNAIRES

SURVEY FOR STUDENTS

✓ **Instructions: Please put a check (/) in the space provided to indicate your best response to the questions below. Do not write your name on this questionnaire.**

DEMOGRAPHIC:

1. **What is your grade?**

❑ Grade 11 ❑ Grade 12

2. **Gender:**

❑ Male ❑ Female

3. **School Type:**

❑ Academy (Day) ❑ Academy (Boarding)

4. How important do you think having access to technology is to your education?

❑ Very important ❑ Important ❑ Not very important

5. When you are using technology to help with your schoolwork, where are you most likely to be?

❑ At home ❑ At my school ❑ At the public library
❑ At a community center or after school club ❑ At the mall
❑ At a friend's house

6. When you are at your school, where at school do you use technology most often?

❑ In a classroom ❑In a computer lab ❑ In the school library
❑ In the guidance office ❑ I do not regularly use technology at my school

7. In your free time, what is your #1 use of technology?

❑ Talk with or email friends or family members
❑ Play games ❑ Listen and download music
❑ Get information about places to go and things to do
❑ I only use technology for my schoolwork
❑ None of the above

USE OF TECHNOLOGY:

Instructions: Indicate by using a check mark in the appropriate box. Please put a check (√) in the space provided

8. In a typical week, I use the following technology products regularly at school?

	Strongly Disagree	Disagree	Natural	Agree	Strongly Agree
Desktop Computers					
Laptop Computers					
Cell Phone					
PDA					
Digital Camcorder					
Scanner					
CD Burner					
MP3 Player					
I-Pod					

TECHNOLOGY USE IN CLASS:

9. I use technology most effectively in the following subjects at school:

	Strongly Disagree	Disagree	Natural	Agree	Strongly Agree
English					
Math					
Science					
Social Studies/History					
Foreign Language					
Art					
Music					
Physical Education					
Yearbook or Newspaper					
Career or Job Training					

10. I have done the following using the Internet:

	Strongly Disagree	Disagree	Natural	Agree	Strongly Agree
Write report using information from the					
Get help from an online tutor					
Visit websites that have been set up for my school					
Create a web page for a school					
Use IM to talk to a classmate about a class project					
Contribute to a web blog					
Email a teacher					
Check on a class grade					
Use an online textbook					
Download a study guide					

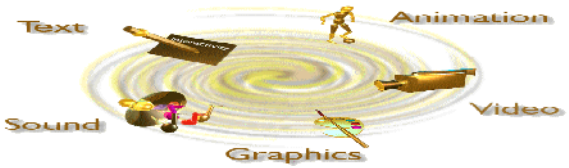
11. What if any, obstacles do you face in using technology at your school?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Not enough computers					
Computers work regularly					
Fast access time to get on the Internet					
Teacher is knowledgeable and skilled in computer use					
I know how to use the technology at my school					
Computers are in a convenient location to use					
Update software					
Enough time in the school day to use computers or access the					

THANK YOU FOR YOUR PARTICIPATION AND CONTRIBUTION TO IMPORVING TECHNOLOGY IN EDUCATION

RETURN THE QUESTIONNAIRE TO TEACHER

SURVEY FOR TEACHERS



Instructions: Please put a check (√) in the space provided to indicate your best response to the questions below. Do not write your name on this questionnaire.

DEMOGRAPHIC

1 **Age**

□18 –21
□22 –25
□Over 26

2 **Gender**

□Male
□Female

3. Race or Cultural Identity

□ American Indian/Alaskan Native
□ Black/African-American
□ Native Hawaiian/Other Pacific Islander
□ Other
□ Asian
□ Caucasian/White
□ Hispanic

4. What grades do you plan on teaching?

□Pre-K □K-2 □3-5 □6-8 □9-12

5. What subject area do you plan on teaching?

□Multiple subjects (elementary)
□Math
□Science
□ Visual and performing arts
□Physical education
□Business
□ Special education
□ Other
□ English
□Social Studies or History
□Foreign language
□Yearbook or Journalism
□Technology
□ Vocational
□ English as a second language

6. Where are you most likely to be when you access the Internet for professional tasks?

□My classroom
□Teacher work room
□A friend's house
□ Computer lab
□Home
□ School library
□ Public library

USE OF TECHNOLOGY:

Instructions: Indicate by using a check mark in the appropriate box. Please put a check (√) in the space provided

7. I use technology to do the following on a regular basis:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly
Talk with or email with friends or family members					
Get information about events, activities, or hobbies					
Shopping					
Play games					
Find out about current events, sports, weather					
Listen to music or download					
Use graphics, design, photo editing, video editing, or music editing software					
Find out about entertainment, new music, celebrity gossip					
Learn about health, nutrition, or fitness topics					
Look for or apply for a job					
Update a personal web page, for example Friendster					
Participate in online communities, clubs, groups,					
Express my opinion on discussion boards, chat					
Find out about volunteer or donation					
Contact government agencies (such as the IRS)					
Online banking					
Personal research or learn how to do					

8. Which of these technology tools do you use in a typical week for work?

	Daily	Frequent	Seldom	Never
Desktop Computer				
Laptop Computer				
Cell Phone				
Hand-held device (PDA)				
Digital camera				
Video camera				
Scanner				
DVD or CD burner				
MP3 player or IPod products				
Video game player				
Smart board				

9. Which of these <u>Internet tools</u> do you use in a typical week for work?

	Daily	Frequent	Seldo	Never
Email				
Listservs				
Specific Internet websites you already have bookmarked				
Search engine (e.g. Google) or research sites (BigChalk)				
News website				
Instant Massager (IM)				
Discussion boards				
Chat rooms				
Web logs (blogs)				
Portal sites (i.e. Blackboard or				

TECHNOLOGY PREPARATION:

10. My pre-service education adequately prepared me to use advanced technology for my instruction.

Strongly Disagree □ Disagree □ Neutral □ Agree □ Strongly Agree □

11. I consider myself well prepared to use the following:

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly**
Productivity tools (e.g. how to use email, spreadsheets, presentation software, etc)					
Instructional tools (student information systems, human resources system)					
Instructional tools (class management tools, website development, online grading)					
Integrating technology into the curriculum (general theory)					
Integrating technology into the curriculum (specific content areas)					

12. I have been adequately prepared to handle the following:

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Online bullying (cyber-bullying)					
Invasion of privacy					
Advertising and spam					
Pornography					
Hacking and viruses					
Digital divide – lack of access for all students to technology					
Plagiarism					
Piracy and illegal downloading					

13. I have been adequately prepared to use the following effectively:

	Strongly	**Disagree**	**Neutral**	**Agree**	**Strongly**
Keep records such as grades and attendance					
Word processing, handouts, other materials					
Research, prepare, and present lessons					
Facilitate project-based learning activities					
Participate in online professional development					
Research information for your students					
Conduct student assessments					
Use an online content provider, for example PLATO					
Use a school content portal, like Blackboard					
Research special needs – learning disabilities					
Research family and social services, medication, other health and behavioral					
Communicate with professional					
Update a class or school web page or create a Webquest					
Access the website of an educational association, such as NCTM, ISTE, etc					

14. I have been prepared to use technology to help me teach:

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly**
Email-an-expert or online chats					
Online textbooks					
Online classes					
Subject specific websites (e.g. NASA, National Weather Services, University websites,					
General search engines (e.g. Google)					
Database or online directories					
Online simulations					
Subject specific software					
Streaming videos					

AVAILABILITY FOR USE AT INSTITUTIONS:

15. The following are readily available

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Enough computers					
Working Computers					
Fast or reliable working Internet access					
Computers are in a convenient					
Adequate software					
Software or websites that support state or district					
Enough time in school day					
Enough time for planning					
Reliable technology support					
Support from administrators					
Adequate knowledge of how to use or integrate the technology					

16. If I were to design a new computer lab for teachers like me, I would consider the following very important for teacher to have at that new school:

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Fast, wireless Internet access throughout the school					
New up-to-date software					
A new computer for every teacher					
A hand-held device (like a PDA) for every teacher to borrow					
Digital cameras for teachers to borrow					
Video equipment for teachers to borrow					
A teacher's computer lab, open on weekends					
A teacher's computer lab, open on evenings					
Scheduled teacher development time for learning with technology					
Access to the school network from home					
Adequate technology maintenance and support					
New computers throughout the school so students can go online whenever they want					
A film studio with all of the appropriate software and equipment					
A laptop for every student					

THANK YOU FOR YOUR PARTICIPATION AND CONTRIBUTION TO IMPORVING
TECHNOLOGY IN EDUCATION.
RETURN THE QUESTIONNAIRE TO TEACHER

REFERENCE LIST

REFERENCE LIST

Adamy, P., & Boulmetis, J. (2006). The impact of modeling technology integration on pre-service teachers' technology confidence. *Journal of Computing in Higher Education, 2*(1), 100-120.

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